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The Etiology of Mental Deficiency With Special Reference to Its Occurrence in Twins:

A Chapter in the Genetic History of
Human Intelligence

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§ 1. *Plan and Scope of the Study.*

Physicians have many times observed and reported a familial tendency toward certain nervous and mental disorders. Hence has arisen a theory to the effect that in the etiology of such disorders hereditary factors play a more or less important part.

In special researches which have been undertaken in connection with this problem three different methods have been employed: the statistical method, as, for example, in the studies published by the Francis Galton Laboratory of Eugenics of the University of London; the Mendelian method, as in the studies published by the Eugenics Record Office in this country; and the method based on study of twins.

The first two methods have furnished more or less significant confirmation of the theory of an hereditary factor or factors. The last method has not yet been employed in a thoroughgoing way, although it has been pointed out many times—first by Francis Galton (1)—that cases of mental disorders in twins constitute the most promising clinical material for the purpose in hand.

In the spring of 1930 we undertook to collect material for a

study of mental disorders in twins with the intention of gathering, for each clinical group, a sufficient amount of such material to make possible a statistical treatment of it.

The task of collecting material was completed in the early part of 1933, by which time we had gathered records of 1,014 pairs of twins with a mental disorder in one or both of the twins in each pair. We had also gathered records of 308 pairs of normal twins for use as control material. Since then we have been occupied with the work of analyzing our material by clinical groups and preparing the findings for publication.

In our collection are included 366 pairs of twins with mental deficiency in one or both of each pair. The main objects of this communication are to present this part of our material and to report a study of the etiology of mental deficiency based largely on it.

In collecting our material it has been our special endeavor to secure a representative sampling and to avoid a biased selection. As has often been pointed out, there is danger in this connection of overloading the collection with monozygotic twins and with instances of both twins of the pair affected by the disorder studied, unless special care is taken to avoid it. As will be shown, our material includes monozygotic, same-sex dizygotic, and opposite-sex twins in proportions which correspond closely to their respective incidences in an unselected series.

It need hardly be pointed out that the value of such material as ours is largely dependent on the accuracy with which it has been possible to distinguish between monozygotic and dizygotic twins. Opposite-sex twins, being always dizygotic, can serve to some extent as control material. As such, however, they are not wholly satisfactory on account of the more or less disturbing sex factor which is introduced through their use in this way. It is necessary, therefore, to resort to the best available methods for distinguishing among same-sex twins the monozygotic from the dizygotic cases.

The problem of making this distinction is a peculiar one. On the one hand, the distinction can be made with a close approach to certainty in a large majority of the cases almost at a glance;

on the other hand, there seems to be no single criterion which can serve for making that distinction in all cases.

It was widely held, at one time, that all monozygotic twins were also monochorionic and with a single placenta and that only dizygotic twins were dichorionic and with two placentas. But in recent years it has been amply shown that this is not invariably true by any means, although it holds for a majority of cases. Thus this criterion becomes merely one of a number of available criteria with the aid of which it is possible to secure an accumulation of evidence pointing more or less consistently one way or the other.

In our experience, pertaining, as it did, to twins of all ages, it soon appeared that usable data concerning fetal membranes and placentas were, as a rule, not to be had.

Close similarity of finger and palm print patterns in monozygotic twins have also been prominently mentioned as a trustworthy criterion for making the desired differentiation. But this, too, is by itself quite inconclusive either way and holds, among available criteria, a position subordinate to such traits as eye color, resemblance in features, and perhaps two or three others (2, 3).

In our own work, by reason of the large number of cases studied, it was not feasible to resort to finger and palm prints, nor to blood groupings.

Most students of human twins, following Siemens (4), base the diagnosis of type of twins not on some one or two criteria, but rather on the cumulative evidence of a larger number of available criteria. Among these not all have the same weight. Perhaps the weightiest is a close resemblance in features or the absence of such. According to a computation recently made by Rife the chance of error in two illustrative cases of monozygotic twins pictured in his article (3) amounts, respectively, to 1 in 480,000 and 1 in 319,999.

With regard to some criteria an absence of resemblance is almost conclusive of dizygotic type of twins, whereas a close resemblance would be, in itself, inconclusive of monozygotic type. This is true of the very weighty criterion of eye color.

In our work diagnosis of type of twins has been based on the following criteria, listed here in the order of our conception of their relative weightiness: close resemblance in features; color of eyes; color of hair; form and texture of hair, *i.e.*, whether straight, wavy or curly, fine or coarse, including hair arrangement and distribution; smooth or furrowed tongue; shape and arrangement of teeth; shape of ears; one or two placentas; color and texture of skin; stature, posture, gait; body weight.

In presenting our material in this communication we have decided to omit reference to the criteria on which diagnosis of type of twins has been based in the individual cases, as such reference could consist only of repeated reiterations of the list already given.

No doubt errors have been made in this connection, but it seems probable that the errors have not been so numerous as to affect materially the validity of our findings. As already stated, our group of opposite-sex twins serves to some extent as control material.

Whoever has undertaken psychiatric family studies on any considerable scale has soon found himself confronted with the perplexing problem of polymorphism. In planning our study of twins and in the early stages of it we were rather inclined to assume that in twin material this problem would not obtrude itself prominently, and perhaps not at all in connection with our monozygotic group. This assumption has not been borne out eventually by our findings.

As the material to be presented in this communication will show, there are among twins of all types—monozygotic, same-sex dizygotic, and opposite-sex—many instances of both quantitative and qualitative dissimilarity as well as complete discordance of findings. Mental deficiency seems to be fundamentally related to infantile palsies, epilepsy, some types of psychotic disease, behavior problems of children, juvenile delinquency, and adult criminality. We find these conditions often associated with mental deficiency not only in the two twins of a pair, but also, in various combinations, in the same individual.

Originally our study was inspired by the purpose of gaining a

more precise estimate of the relative importance of hereditary and environmental factors in the etiology of so-called constitutional mental disorders. As our material grew in amount and the more closely we scrutinized it, it appeared more and more definitely that the simple division of etiologic factors into those of heredity and environment was misleading in that it tended to draw attention away from complexities which should receive detailed consideration.

In the literature pertaining to the etiology of mental and behavior disorders one finds reference to factors designated not only as hereditary, but also as inborn, congenital, prenatal, constitutional, endogenous, and the like. We believe that, with the aid of our material and similar material to be found scattered in the literature, a more exact terminology and a more useful classification of etiologic factors can be devised.

While such material as ours is not likely to throw new light on the *nature* of the etiologic factors, it can indicate quite definitely the *developmental period* in which such factors are operative.

To be more specific, etiologic factors can be classified as follows: pre-germinal, germinal, embryonic, fetal, intranatal, and as of various periods of postnatal development (5).

The factors which we would designate as *pre-germinal* are the only ones which may properly be spoken of as hereditary. They are the factors which are already operative in the ancestry of a given generation before that generation has entered upon the very beginnings of its existence in the form of primordial follicles in the ovary and of spermatocytes in the testis.

To establish the influence of a pre-germinal factor or factors in the etiology of a given disorder it is not enough to show that it runs in families; that fact alone can often be accounted for by exposure of familial groups to the same environmental conditions. The criteria which are obviously required for attributing a given disorder *solely* to pre-germinal factors are as follows: (a) that the disorder in question is apt to be found in members of two or more generations of certain familial strains; (b) that, if found in one of a pair of monozygotic twins, it is invariably

present in the other as well; (c) that, if found in one of a pair of dizygotic twins, it is commonly absent in the other; and (d) that it occurs with no greater frequency in the dizygotic twin-brothers and twin-sisters of affected subjects than in their singly-born siblings.

An outstanding example of a neuropsychiatric condition determined solely by a pre-germinal etiology is presented by Huntington's chorea. All the above mentioned criteria are fulfilled.

As regards the genetic mechanism underlying the etiology of hereditary mental disorders, twin material affords not the slightest clue. Such material can only help in determining whether, and to what extent, hereditary factors play a part in the etiology; but not whether we are dealing with a monofactorial, difactorial, or polyfactorial mechanism, or whether sex linkage is involved, or whether the genetic mechanism is of even higher complexity, producing effects by a general balancing of factors rather than by one or a few specific genes.

Germinal factors in the etiology of mental disorders have received inadequate attention, and when referred to at all they have not been distinguished from pre-germinal factors.

The germinal period of development is a long and highly complicated one. There is evidence in the data of human histology that all the primordial follicles out of which ova are eventually to develop exist in the ovary of the female infant at birth, and, in fact, for several months before birth. It will be seen, then, that before an ovum has matured and become fertilized by a spermatozoön, it has been in existence for a period of from twelve to forty-five years—more or less—during which time it has gone through various phases of development. During this period it has been exposed to factors which have either fostered or hindered its development or which have possibly had a pathogenic effect.*

* This has recently been questioned by Evans and Swezy, who state: "The concept that, in the mammalia, the ova are all formed before birth and remain quiescent until sexual maturity calls them into activity, has no foundation in fact. On the contrary, all the ova of adult life are new formations and are being constantly produced and as constantly destroyed. These processes are part of the rhythmic production and destruction of tissue in the generative

The germinal history of a spermatozoön, while quite different from that of an ovum, nevertheless also occupies a considerable period, during which it may be exposed to various factors for better or for worse.

The criteria which are obviously required for attributing a given disorder solely to germinal factors are the same as those for pre-germinal or hereditary factors, with the exception of the first criterion—that of familial occurrence.

An outstanding example of a neuropsychiatric condition based on a germinal etiology is presented by mongolism. This condition is hardly ever found in more than one member of a familial group. Moreover, mongols are sterile and short-lived, so that direct hereditary transmission is practically out of the question. Yet, it has been shown that, if one of a pair of monozygotic twins is a mongol, the other is quite invariably also a mongol; but among dizygotic twins it is regularly observed that, if one is a mongol, the other is normal (6). There is evidence pointing to old ovulation scars as having to do with some injury to the ovum resulting in mongolism.

Embryonic factors are, of course, those which are operative in the corresponding period of development, *i.e.*, in the period which extends from the moment of fertilization of the ovum to the end of the seventh or eighth week of gestation. Among the conditions produced by factors operative in this period are to be counted cases of disorder of development resulting in congenital monstrosities or deformities, severe (*e.g.*, acardiac monsters) or of a milder sort (*e.g.*, harelip or cleft palate), with or without mental deficiency. Such conditions are apt to affect one of a pair of monozygotic twins and not the other; or both, but in an unequal degree.

Fetal factors, which are operative in the developmental period

tract which is without parallel in any other organ in the body. Far from the conception of Waldeyer, who estimated the life of many ova at 50 years, mammalian ova have a singularly short existence. It may indeed be questioned whether, if we accept the elements of the blood, they do not have the shortest life span of any cells in the body." (Evans, H. M., and Swezy, O.: *Ovogenesis and the Normal Follicular Cycle in Adult Mammalia*. Memoirs of the Univ. of Calif., 9:119, 1931.)—This view is based on a thoroughgoing research and is probably correct; but it does not affect the evidence of germinal factors in the etiology of certain mental disorders.

extending from the end of the seventh or eighth week of gestation to the onset of labor, may be known by their tendency to bring about premature birth, or underweight condition at birth, or both. They are very apt to produce similar or related disorders in both of a pair of dizygotic twins with a frequency greater than such disorders are to be found in both of a pair of siblings.

Intranatal factors, which are operative in the brief period extending from the onset of labor to the moment of delivery, are often difficult to disentangle from fetal factors. They, too, are apt to give rise to similar or related disorders affecting both of a pair of dizygotic twins with special frequency as compared with pairs of siblings. Here are involved the many factors of dystocia which may result in cerebral birth trauma.

Postnatal factors are for the most part better known, as their operation and effects are often under direct observation. Sufficiently large numbers of cases of mental deficiency, behavior difficulty, juvenile delinquency, and psychotic disorder, with or without neurologic complications, have been observed and reported as following meningitis, encephalitis, or postnatal head trauma to establish the adequacy of these and other postnatal factors in the etiology of mental disorders. However, it is not always clearly recognized, in spite of such observations, that so-called constitutional mental disorders can be produced by such factors and that there is nothing whatever hereditary or inborn in their etiology in such cases.

It has already been intimated that only in conditions arising solely on a basis of pre-germinal or germinal etiology is uniform concordance of findings to be expected among monozygotic twins. Conditions produced by embryonic, fetal, intranatal, and postnatal factors, as they may be observed in monozygotic twins, frequently present, in the two twins of a pair, quantitative or qualitative dissimilarities or total discordance of findings.

With reference to certain conditions complete or partial concordance of findings is very often observed in dizygotic as well as monozygotic twins. As we shall demonstrate with the aid of material to be presented in subsequent sections of this communi-

cation, mental deficiency is one of these conditions. This can be accounted for only by the operation of embryonic, fetal, intra-natal, or early postnatal etiologic factors to which both twins of the pair have been exposed together.

The main criterion on the basis of which such a mode of etiology can be established consists in the greater frequency of complete or partial concordance of findings in pairs of dizygotic twins as compared with pairs of singly-born siblings. In connection with some conditions sex is a factor in etiology. In such cases the disturbing influence of this factor can be eliminated by comparing same-sex twins, male and female, and opposite-sex twins only with same-sex siblings, male and female, and opposite-sex siblings, respectively.

With reference to the suggested classification of etiologic factors of "constitutional" mental disorders, according to the developmental periods in which they are operative, it is possible—and indeed necessary—to distinguish three types of etiologic mechanism. These may be designated, simple, multiple or variable, and complex etiology.

We use the expression *simple etiology* in those cases in which the disease-producing action is limited to a factor or factors operative in only one of the developmental periods which have been enumerated. One example of such a case is presented by Huntington's chorea, which is caused by a pre-germinal factor and nothing else. Another example is presented by mongolism, already referred to, as a condition caused solely by a germinal factor.

We speak of *multiple or variable etiology* in connection with conditions which may be produced now by a factor operative in one period of development and now by a factor operative in another. Perhaps the most outstanding example of such a condition is that of mental deficiency. In any large group of unselected cases of mental deficiency the fact of multiple or variable etiology can readily be demonstrated.

We speak of *complex etiology* in connection with those cases in which two or more factors, operative in different developmental periods, are required to produce the condition in question.

For example, many cases of Little's disease, mental deficiency, and epilepsy are produced by a combination of fetal and intra-natal factors: the fetal factors determine premature birth or markedly under-weight condition at birth with a resulting special vulnerability of cerebral tissues and structures, while the intra-natal factors determine a cerebral birth injury which is not so likely to occur in a mature fetus delivered at full term (7, 8, 9). Another example is presented by some cases of manic-depressive psychoses in which it can be shown that pre-germinal, *i.e.*, hereditary factors determine an emotional temperament characterized by a predisposition toward emotional disorders, while a factor or a series of factors, often psychogenic in nature, operative perhaps in the fourth or fifth decade of life, precipitate the mental breakdown (10).

§ 2. *General Survey of the Material.*

Mental deficiency is not a simple clinical entity. Under that designation are included cases which differ from one another not only in degree of intellectual defect, but also in etiology, clinical manifestations and complications, and physical pathology. Moreover, a sharp line of demarcation cannot be drawn between mental deficiency and normal intelligence, except by arbitrary policy.

In the material on which this communication is based are included not only cases of uncomplicated mental deficiency, but also cases complicated with paralysis, epilepsy, psychotic disease, child behavior difficulty, juvenile delinquency, and adult criminality—as will be shown in detail in subsequent sections.

There is probably a difference between higher and lower degrees of mental deficiency in the manner of etiology, and we made it a special point to include in our material cases of so-called borderline intelligence represented by I.Q. up to 79 in the *propositus*.

The resulting collection of material is, of course, a heterogeneous one; and it is only for the purpose of a general survey of it by way of introduction that we have summarized it for presentation *en masse* in Table I.

For the purpose of this presentation a pair of twins have been

counted as "both affected" not only if both had mental deficiency in the same or different degrees, but also if one had mental deficiency and the second had one of the complicating conditions enumerated above without coexisting mental deficiency.

In order to make reasonable allowance for errors of technic in mental testing we have counted a pair of twins as "similarly affected" not only when they had the same I.Q., but also when they differed in I.Q. to an extent not exceeding five points.

TABLE I
THE MATERIAL SUMMARIZED

Monozygotic				Same-sex dizygotic				Opposite-sex		
Males		Females		Males		Females				
Both affected	One affected	Both affected	One affected	Both affected	One affected	Both affected	One affected	Both affected	Male alone affected	Female alone affected
59	6	56	5	28	13	34	26	66	49	24

If both twins of a pair were mentally deficient but differed by more than five points in I.Q., the case was counted among those representing "quantitative dissimilarity."

In pursuit of this policy, if one of a pair of twins had an I.Q. of 79, the case was counted as an instance of "both affected, similarly" if the other twin had an I.Q. higher by not more than five points, *i.e.*, above our arbitrary upper limit for mental deficiency. Thus, in some of the cases of "both twins affected" one of the pair has an I.Q. as high as 84. In other words, by arbitrary policy, the upper limit of mental deficiency has been set at I.Q. 79 for *propositi* and at I.Q. 84 for the second twins.

The nature of the material dealt with is such as to necessitate the adoption of some more or less arbitrary policy in classifying it and arranging it for presentation. The reader will be able to judge for himself, in going over the subsequent sections, as to the justification for the particular policy which we have adopted. In outlining our policy, such as it is, we have at least made clear the basis on which rest our use of terms, the selection of our material, and its presentation in the tables.

It should be added here that cases of mongolism in twins have not been included in the material on which this study is based. We found a few such cases as we were gathering our material, but they have been made the subject of a separate study and have already been reported (6). Mongolism seems to be a clear cut clinical entity with a special etiology.

Our material as a whole, treated in the manner described above and summarized in Table I, yields the following general results:

1. In the great majority of cases among monozygotic twins—but not in all—both twins of each pair are affected.

2. In 8.7 per cent of the cases among monozygotic twins we find only one of each pair affected, *i.e.*, complete discordance. In these cases one of the twins is free not only from mental deficiency, but also from any of the listed complicating conditions.

3. The group of same-sex dizygotic twins presents a marked contrast, in this respect, in comparison with the monozygotic group. We find complete discordance in no less than 38.6 per cent of the cases.

4. A still greater contrast is found in connection with our group of opposite-sex twins. Here we find complete discordance in more than one-half of the cases—52.5 per cent.

These findings suggest the following general propositions:

- (a) Pre-germinal (*i.e.*, hereditary) or germinal factors seem to play an important part in the etiology of mental deficiency and allied conditions, as is shown by the contrast between monozygotic and dizygotic twins in the respective proportions of cases of concordant findings.

- (b) In a considerable group of cases pre-germinal or germinal factors, if they exist at all, are not in themselves adequate for the production of mental deficiency, as is shown by the cases among monozygotic twins in which only one of each pair is affected.

- (c) Pre-germinal or germinal factors are not always present—therefore not essential—in the etiology of mental deficiency. This is shown by the contrast between dizygotic twins and siblings with regard to the respective frequencies of complete or partial concordance of findings. In our material we find, among

dizygotic twins, "both affected" in 53.3 per cent of the cases; whereas among the singly-born brothers and sisters of subjects with mental deficiency the frequency of mental deficiency, epilepsy, psychotic disease, and miscellaneous neuropsychiatric conditions has been found, in a recent study of Humm (11), to be less than one-third of that figure, namely 16.5 per cent.

There is no reason for assuming that there is a closer genetic relationship between dizygotic twins than between their siblings. In so far as mental deficiency is of pre-germinal or germinal etiology, it should not be more common among the dizygotic twin-brothers and twin-sisters of affected subjects than among their singly-born siblings. If found to be more common, the fact could be attributed only to factors, operative not earlier than in the embryonic period of development, which are more often at work in multiple than in single pregnancies and births.

(d) The fourth and last proposition suggested by the data revealed in Table I is that sex is a factor in the etiology of mental deficiency. This is shown not only by the contrast between the same-sex and opposite-sex dizygotic groups, already referred to, but also by the fact that among male subjects represented in our material 87.7 per cent, and among the female subjects 79.0 per cent, are affected with mental deficiency or allied conditions.

Perhaps the most conclusive evidence, in this connection, is furnished by our group of opposite-sex twins, in which the excess of males affected, as compared with females, amounts to 27.8 per cent.

It is hardly necessary to point out here that a higher incidence of mental deficiency in the male sex has been noted repeatedly and is a finding in harmony with general clinical experience. This subject will receive special consideration in a later section of this communication.

§ 3. *Monozygotic Twins.*

Group 1. Uncomplicated mental deficiency; both affected, similarly; males. Twenty-three cases, 1-23.

Case 1. W. twins, Verl and Virgil. Born in Riverside, Calif., Jan. 25, 1915. Our observation of them was in December, 1931, in the Riverside city schools.

Retarded in studies, repeated second and third grades. Mental tests in 1929 revealed, for both, I.Q. 77.

Case 2. S. twins, Jack and Jimmie. October 16, 1925. Our observation of them was in May, 1932, in the Los Angeles city schools. Retarded in studies. Mental tests in 1932 revealed, for Jack, I.Q. 77; for Jimmie, 75.

Case 3. A. twins, Henry and Miles. Born in Keene, N. H., June 14, 1899. Our observation in August, 1930. Henry was admitted to the Wrentham State School, Mass., September 2, 1910, and Miles November 5, 1915. Later both were transferred to Belchertown Farm and are still there. Mental tests in 1928 revealed, for both, I.Q. 76.

Case 4. Y. twins, John and Ralph. Born December 23, 1915. Our observation in April, 1931, in opportunity class in Berkeley, Calif., city schools. Mental tests in 1927 revealed for John, I.Q. 76, for Ralph, 75.

Case 5. H. twins, Floyd and Lloyd. Born in Dallas, Tex., November 30, 1920. Our observation in March, 1932, in Long Beach, Calif., city schools. Mental tests in 1930 revealed, for Floyd, I.Q. 76, for Lloyd, 73.

Case 6. M. twins, Morris and Phillip. Born February 2, 1917. Our observation in April, 1931, in ungraded class, San Francisco city schools. Mental tests in November, 1923, revealed, for both, I.Q. 74.

Case 7. M. twins, Jesus and Benito, part-Indian. Born near Anaheim, Calif., February 28, 1918. Our observation in December, 1931, in La Palma School, Anaheim. Mental tests in 1929 and 1930 revealed, for Jesus, I.Q. 68, for Benito, 63.

Case 8. M. twins, Manuel and Isobel. Indian (Mexican). Born in Santa Monica, Calif., August 22, 1914. Our observation in January and February, 1931: Manuel in part-time school, Isobel in special class, Santa Monica city schools. Mental tests made, for Isobel, in 1929, and, for Manuel, in 1931, revealed, for both, I.Q. 67.

Case 9. K. twins, Michael and George. Born April 5, 1918. Michael was admitted to Letchworth Village, Thiells, N. Y., April 19, 1928; George, June 24, 1927. At the time of our observation of the case, which was in January, 1931, they were still inmates there. Mental tests made, respectively, in 1929 and 1930, revealed, for Michael, I.Q. 67, for George, 65.

Case 10. O. twins, Robert and Richard. Born in Orange County, N. Y., in August, 1918. Admitted together to Letchworth Village, Thiells, N. Y., December 3, 1924. At the time of our observation of the case, which was in January, 1931, they were still inmates there. Mental tests made, respectively, in 1929 and 1930, revealed, for Robert, I.Q. 65, for Richard, 64.

Case 11. DiM. twins, Paul and Bartlo. Born in Los Angeles, September 24, 1926. Our observation in April, 1932, in Los Angeles city schools. Mental tests in 1931 revealed, for Paul, I.Q. 65, for Bartlo, 63.

Case 12. P. twins, Joe and Pasquale. Born in Berkeley, Calif., in April, 1914. Our observation in March, 1932, in Berkeley Child Guidance Clinic. The twins are two years retarded at school. Mental tests in 1929 revealed, for Joe, I.Q. 65, for Pasquale, 62.

Case 13. L. twins, William and Gerald. Born in New York City October 8, 1914. Admitted together to Children's Hospital and School, Randall's Island, N. Y., October 13, 1926. Transferred to Letchworth Village, Thiells, N. Y., January 4, 1928. At the time of our observation of the case, which was in July, 1931, they were still inmates there. Mental tests in 1929 revealed, for William, I.Q. 64, for Gerald, 62.

Case 14. P. twins, Manuel and Joe. Born in Oakland, Calif., July 20, 1923. Our observation in April, 1932, in pre-primary room, Highland School, Oakland: "Not yet ready for first grade; take no part in school room proceedings; just sit." Mental tests in August, 1929, revealed, for both, I.Q. 60.

Case 15. L. twins, Harold and Harry. Born March 15, 1915. They had done very poorly in school and, on July 5, 1929, were placed in the Berkshire Industrial Farm, Canaan, N. Y. On October 22, 1929, they were transferred to the State School at Rome, N. Y. At the time of our investigation of the case, which was in October, 1930, they were still inmates there. Mental tests in 1929 revealed, for Harold, I.Q. 60, for Harry, 56.

Case 16. T. twins, Herman and Harold. Negro or part-Negro. Born September 5, 1912. Our observation in April, 1931, in opportunity room, Durant School, Oakland, Calif. Mental tests in 1927 revealed, for Herman, I.Q. 58, for Harold, 55.

Case 17. C. twins, Ervin and Earl. Born in Redlands, Calif., June 21, 1909. Admitted together to Sonoma State Home, Eldridge, Calif., August 2, 1924. Paroled August 6, 1930. At the time of our observation of the case, which was in April, 1931, they were with their father at San Bernardino, Calif., doing odd jobs, mostly gardening. Mental tests in 1924 revealed, for Ervin, I.Q. 57, for Earl, 56.

Case 18. DeR. twins, Clement and Louis. Born in New York March 2, 1914. Admitted together to Letchworth Village, Thiells, N. Y., April 24, 1929. At the time of our investigation of the case, which was in January, 1931, they were still inmates there. Mental tests in 1930 revealed, for Clement, I.Q. 54, for Louis, 49.

Case 19. R. twins, Lawrence and Leonard. Born in Michigan, 1906. They are said to have had cerebrospinal meningitis at the age of one year. They were in the school for the feeble-minded at Lapeer, Mich., until the spring of 1919, when they were taken home and cared for privately until November 12, 1929. On that date they were admitted to the institution for the feeble-minded at Orient, Ohio. At the time of our observation of the case, which was in August, 1932, they were still inmates there. Mental tests in 1930 revealed, for both, I.Q. 29.

Case 20. C. twins, Anthony and Nicholas. Born in Coney Island, N. Y., August 15, 1921. Admitted together to Children's Hospital and School, Randall's Island, N. Y., May 17, 1928. Removed by parents, against advice of the superintendent, September 20, 1928. At the time of our investigation of the case, which was in July, 1931, they were being cared for at home. Their birth was premature by one month. Mental tests in May, 1928, revealed, for both, I.Q. 27.

Case 21. D. twins, James and John. Born in Quincy, Mass., May 8, 1920. Birth was full term, but prolonged, and delivery was instrumental. Admitted together to Children's Hospital and School, Randall's Island, N. Y., August 13, 1928. At the time of our investigation of the case, which was in July, 1931, they were still inmates there. Mental tests in May, 1929, revealed, for James, I.Q. 24, for John, 22.

Case 22. H. twins, Harold and Lester. Negro or part-Negro. Born in United States, exact place and date of birth not given. At the time of our investigation of the case, which was in August, 1930, they were in the Colony for Feeble-minded Males at Woodbine, N. J., and were said to be fourteen years old. Mental tests revealed, for both, I.Q. 5.

Case 23. W. twins, Willie Mark and Wesley Marvin. Born in Wichita, Kan., July 2, 1929, in the Salvation Army Home and Hospital. Mother is feeble-minded, I.Q. 24. No one knows who the father is. They were observed by us in August, 1931, at the State Training School for Mental Defectives at Winfield, Kan., where they had been inmates since February, 1930. They were physically healthy, but mentally obviously defective, leading a vegetative existence. They were too young and too low mentally to be tested.

Group 2. Uncomplicated mental deficiency; both affected, similarly; females. Thirty cases, 24-53.

Case 24. T. twins, Adelfina and Ruby. Indian or part-Indian. Born in Casa Blanca, Calif., March 21, 1916. Their mother died at their birth, but there is no definite history of injury to them. Both are retarded in their studies, having repeated the first and second grades and having done poorly since. Observed by us in November, 1931, in the Riverside, Calif., city schools. Mental tests in 1929 revealed, for Adelfina, I.Q. 79, for Ruby, 84.

Case 25. H. twins, Barbara and Norma. Born in Oakland, Calif., April 1, 1920. Observed by us in April, 1931, in the Sequoia School, Oakland, Calif., when they were doing rather poorly in their studies and were in the "z section" of their grade. Mental tests in 1929 revealed, for both, I.Q. 78.

Case 26. M. twins, Gamelle and Ramelle. Born August 18, 1916. Our observation in March, 1932, in Edison Junior High School, Los Angeles. The twins are doing poorly in their studies. Mental tests in 1930 revealed, for Gamelle, I.Q. 77, for Ramelle, 74.

Case 27. M. twins, Roberta and Alberta. Born in California, June 6, 1922. Observed by us in March, 1932, in 109th Street School, Los Angeles. Backward in studies. Mental tests in 1932 revealed, for Roberta, I.Q. 76, for Alberta, 80.

Case 28. D. twins, Margaret and Marjorie. Born in Pasadena, Calif., December 10, 1914. Our observation in December, 1931, in Alhambra, Calif., city schools. They repeated two grades at school. Mental tests in 1931 revealed, for Margaret, I.Q. 76, for Marjorie, 72.

Case 29. A. twins, Francisca and Guadalupe. Part-Indian. Born April 2, 1916. Our observation in April, 1932, in Hollenbeck Junior High School, Los Angeles. Mental tests in 1931 revealed, for Francisca, I.Q. 76, for Guadalupe, 71.

Case 30. C. twins, Aurora and Bertha. Born in California, August 15, 1913. Our observation in March, 1932, in Garfield High School, Los Angeles. Retarded at school. Mental tests in 1931 revealed, for Aurora, I.Q. 75, for Bertha, 73.

Case 31. M. twins, Flora and Florence. Born July 26, 1913. Our observation in April, 1931, in special class, Berkeley, Calif., city schools. Mental tests in 1929 revealed, for both, I.Q. 74.

Case 32. H. twins, Cleo Jane and Ilo Jean. Born in Anaheim, Calif., June 19, 1922. Our observation in September, 1931, in Buena Park, Calif., city schools. Twins were still in kindergarten, but about to be tried in first grade. Mental tests revealed, for Cleo Jane, I.Q. 73, for Ilo Jean, 71.

Case 33. R. twins, Aileen and Catherine. Born in Oakland, Calif., June 9, 1923. Our observation in April, 1932, in Highland School, Oakland, in pre-primary room, as twins were not yet ready for first grade. Mental tests in 1931 revealed, for Aileen, I.Q. 72, for Catherine, 71.

Case 34. H. twins, Alicia and Stella. Part-Indian. Born in Los Angeles in February, 1925. Our observation in January, 1932, in Hammel School, Los Angeles. Mental tests in January, 1931, revealed, for both, I.Q. 71.

Case 35. R. twins, Carmen and Olivia. Part-Indian. Born in California in October, 1921. Our observation in January, 1932, in Eugene School, Los Angeles. Mental tests in 1930 revealed, for Carmen, I.Q. 71, for Olivia, 67.

Case 36. G. twins, Eva and Aurora. Part-Indian. Born in Los Angeles in April, 1921. Our observation in January, 1932, in Los Angeles Orphanage. Mental tests in 1930 revealed, for Eva, I.Q. 70, for Aurora, 67.

Case 37. D. twins, Rose and Daisy. Born in Mount Shasta, Calif., May 17, 1921. Our observation in April, 1932, in "atypical room," Lafayette School, Oakland, Calif. Mental tests in 1930 revealed, for Rose, I.Q. 69, for Daisy, 66.

Case 38. G. twins, Goldie and Sylvia. Born in Los Angeles, Calif., April 21, 1916. Our observation in October, 1932, in Lafayette School, Oakland, Calif. The twins were reported as being extremely shy and doing poorly in studies; they are in a special vocational opportunity group. Mental tests in 1931 revealed, for Goldie, I.Q. 68, for Sylvia, 67.

Case 39. P. twins, Florence and Pauline. Born August 22, 1921. Our observation in April, 1932, in Euclid Avenue School, Los Angeles. Mental tests in 1930 revealed, for Florence, I.Q. 67, for Pauline, 65.

Case 40. G. twins, Angelina and Mary. Born in New York May 19, 1921. Admitted to Letchworth Village, Thiells, N. Y., October 20, 1930. At the time of our investigation of the case, which was in January, 1931, they were still inmates there. Mental tests in 1930 revealed, for Angelina, I.Q. 67, for Mary, 65.

Case 41. R. twins, Helen and Adeline. Born in Oakland, Calif., July 11, 1921. Our observation in April, 1932, in Dewey School, Oakland. The twins had spent three years in the first grade and were in the second grade, but were failing in all studies. Mental tests in 1930 revealed, for Helen, I.Q. 66, for Adeline, 61.

Case 42. C. twins, Sara and Elvira. Part-Indian. Born in Los Angeles April 15, 1924. Our observation in April, 1932, in Marianna School, Los Angeles. Mental tests in 1932 revealed, for Sara, I.Q. 65, for Elvira, 64.

Case 43. W. twins, Ellen and Edith. Born in Duball, Wash., Dec. 31, 1916. Admitted together to State Custodial School, Medical Lake, Wash., January 4, 1927. At the time of our investigation of the case, which was in May, 1931, they were still inmates there. Mental tests in 1927 revealed, for Ellen, I.Q. 53, for Edith, 52.

Case 44. K. twins, Constantina and Helen. Born in Haverhill, Mass., December 11, 1919. Their mental deficiency had been noted in early childhood, they did very poorly in school, did not get beyond first grade. On January 11, 1929, they were admitted to the State School at Wrentham, Mass. At the time of our investigation of the case, which was in August, 1930, they were still inmates there. Mental tests in 1929 revealed, for Constantina, I.Q. 50, for Helen, 48.

Case 45. B. twins, Norma and Lillian. Born in Chicago, May 28, 1891. Since early childhood the twins have been in institutions partly by reason of their mental deficiency and partly on account of blindness due to congenital

cataract. At the time of our observation of the case, which was in January, 1933, they were inmates of the Minnie Barton Training Home in Los Angeles, where they had been for seven years. They had gotten as far as the second grade in school. Mental tests in 1933 revealed, for Norma, I.Q. 49, for Lillian, 44.

Case 46. S. twins, Margaret and Lydia. Born in Erma, N. J., July 15, 1911. At birth they weighed 3 lbs. each and their postnatal growth was very slow. They went to school but remained in the first grade until the age of 12 years. On February 16, 1927, they were admitted to the State Institution for the Feeble-minded at Vineland, N. J., and at the time of our investigation of the case, which was in September, 1930, they were still inmates there. Mental tests in 1927 revealed, for Margaret, I.Q. 36, for Lydia, 33.

Case 47. H. twins, Mary and Margaret. Born in Burdett, Kan., March 27, 1910. These twins were observed by us in their own home in June, 1931. They had not been institutionalized. They attended school for several years, but never learned to read or write. Cannot speak plainly. Their mother stated that they helped around the house. No mental tests were made in this case, but the condition, in both, is obviously one of mental deficiency in the degree of imbecility.

Case 48. N. twins, Louise and Lucille. Born in Thayer, Kan., in 1918. Observed by us in their home in August, 1931. They could not speak plainly, unable to go to school, helped around the house and in the garden. They were causing no trouble and had not been institutionalized. No mental tests were made in this case, but they were obviously mentally deficient in the degree of imbecility. Their older sister is bright, graduated from high school at 16 years.

Case 49. P. twins, Dorothy and Frances. Born in Cincinnati, June 4, 1925. They were studied in the Psychopathic Institute of the Jewish Hospital in Cincinnati in 1928 and 1929. At the age of four years they could say but a few single words, very indistinctly. Our investigation of the case was in June, 1931. No mental tests were made in this case, but the condition is obviously one of mental deficiency in the degree of imbecility.

Case 50. M. twins, Adeline and Mary. Born in New York, November 14, 1902. Admitted together to Letchworth Village, Thiells, N. Y., October 10, 1923. At the time of our investigation of the case, which was in January, 1931, they were still inmates there. Mental tests in 1923 revealed, for both, I.Q. 20.

Case 51. S. twins, Lorena and Loretta. Born in Massachusetts, May 27, 1913. Admitted together to the State School at Wrentham, Mass., April 18, 1919, and at the time of our observation of the case, which was in July, 1932, they were still inmates there. Mental tests in 1929 revealed, for Lorena, I.Q. 19, for Loretta, 16.

Case 52. E. twins, Ruby and Irene. Born in Texhoma, Okla., in 1900. Admitted together to the State School at Enid, Okla., September 6, 1923. At the time of our observation of the case, which was in August, 1931, they were still inmates there. Their mother is also an inmate there classified as an imbecile. Mental tests in 1923 revealed, for Ruby, I.Q. 8, for Irene, 4.

Case 53. A. twins, Agnes and Helen. Born in Pennsylvania, May 19, 1910. Admitted together to the Pennhurst State School, Pa., June 16, 1916. At the time of our investigation of the case, which was in August, 1930, they were still inmates there. Mental tests made on repeated occasions from 1924 to 1927 revealed, for both, I.Q. 4.

Group 3. Uncomplicated mental deficiency; both affected, but in a manner quantitatively dissimilar; males. Eight cases, 54-61.

Case 54. G. twins, Cleto and Fernando. Malayan race. Born in the Philippines May 10, 1911. Observed by us in Redlands, Calif., city schools in December, 1931. Retarded in studies. Mental tests in 1931 revealed, for Cleto, I.Q. 77, for Fernando, 68.

Case 55. E. twins, Rolland and Richard. Born in San Francisco November 6, 1919. Observed by us in April, 1931, in San Francisco city schools, Rolland in the 5B grade, Richard in an ungraded class. Mental tests made, respectively, in 1931 and 1928, revealed, for Rolland, I.Q. 74, for Richard, 67.

Case 56. W. twins, Harold and Roy. Born in San Bernardino, Calif., February 24, 1919. Observed by us in January, 1931, in San Bernardino Opportunity School, to which they had been transferred on account of their poor progress in the regular grades. Mental tests in 1931 revealed, for Harold, I.Q. 73, for Roy, 67.

Case 57. DeW. twins, Lester and Lawrence. Born in Vineland, N. J., May 9, 1922. They are the illegitimate children of a feeble-minded woman who has been, since the age of 20 years, an inmate of the State Institution for Feeble-minded at Vineland. The twins were born and brought up in the same institution. Mental tests revealed, for Lester, I.Q. 72, for Lawrence, 80.

Case 58. L. twins, Smiley and Rohilio. Part-Indian. Born in Mexico, January 8, 1919. Observed by us in June, 1932, at Willard School, Garvey, Calif. Very backward in studies. Mental tests in 1932 revealed, for Smiley, I.Q. 71, for Rohilio, 63.

Case 59. H. twins, Robert and John. Born in Alaska June 11, 1918. Observed by us in April, 1931, in an ungraded class in the San Francisco city schools. Mental tests in 1931 revealed, for Robert, I.Q. 70, for John, 80.

Case 60. M. twins, Henry and David. Born in 1921. Observed by us in April, 1932, in Manchester Ave. School, Los Angeles. Reported as being practically unteachable and requiring institutional care. Mental tests in 1930 revealed, for Henry, I.Q. 46, for David, 40.

Case 61. G. twins, George and Robert. Born in Boston, February 17, 1927. Our investigation in August, 1930, found them in the State School at Wrentham, Mass., where they had been since January, 1929. Mental tests in July, 1929, revealed, for George, I.Q. 24, for Robert, 11. Both have bulging foreheads and congenital goitre.

Group 4. Uncomplicated mental deficiency; both affected, but in a manner quantitatively dissimilar; females. Six cases, 62-67.

Case 62. P. twins, Marion and Mildred. Born in Mount Vernon, Wash., July 26, 1912. They were placed in the State Custodial School at Medical Lake, Wash., August 8, 1919, mainly on account of their undesirable home environment. On November 26, 1930, relatives insisted on taking them home and soon thereafter Mildred married a man much older than herself, and Marion was reported as being promiscuous sexually. At the time of our investigation of the case, which was in May, 1931, they were at large, getting along as stated above. Mental tests in 1930 revealed for Marion, I.Q. 77, for Mildred, 54.

Case 63. R. twins, Agnes and Gladys. Born in Perris, Calif., February 4, 1912. They weighed 4 lbs. each at birth. Did not talk until the age of 3 years. Both were retarded at school, being in the same class with their singly-born

younger sister who always helped them with their work. Mental tests in 1924 revealed for Agnes, I.Q. 75, for Gladys, 83. Observed by us in November, 1931, in their home in Riverside, Calif. Agnes was then married and Gladys, still single, was living with her.

Case 64. W. twins, Reba and Beatrice. Born in Oxford, Pa., July 1, 1909. On December 9, 1918, they were admitted together to the Pennhurst State School, Pa. On July 14, 1929, Reba was transferred to Laurelton State Village, Pa. At the time of our investigation of the case, which was in August, 1930, they were still institution inmates, the one at Pennhurst, the other at Laurelton. Mental tests made, respectively, in 1927 and 1929 revealed, for Reba, I.Q. 72, for Beatrice, 55.

Case 65. M. twins, Sara and Rose Dolly. Born in March, 1923. Observed by us in April, 1932, in Manchester Ave. School, Los Angeles. Sara, under individual attention, has learned to read and make paper flowers, baskets, etc. Rose Dolly seems quite unteachable, cries when given something to do. Mental tests in 1930 revealed, for Sara, I.Q. 57, for Rose Dolly, 49.

Case 66. H. twins, Marjorie Emily and Florence Margaret. Born in Tremont, Me., August 1, 1904. For many years inmates at the state school at Pownal, where our investigation found them in August, 1930. Results of mental tests not available, except that they indicate, for Marjorie Emily, low grade moronism, and, for Florence Margaret, high class imbecility.

Case 67. S. twins, Adelaide and Amanda. Part-Indian. Born in San Francisco, December 23, 1913. Delivery was instrumental. Amanda was the first-born and has been from birth slightly shorter in stature and lighter in weight than Adelaide. At the time of our observation, which was in November, 1932, they had not been institutionalized, but were under the supervision of the Los Angeles County Probation Department, and an application was pending for their admission to the state institution for the feeble-minded at Spadra, Calif. Mental tests made in 1932 revealed, for Adelaide, I.Q. 28, for Amanda, 19.

Group 5. Uncomplicated mental deficiency; one affected; males. Two cases, 68-69.

Case 68. C. twins, Floyd and Lloyd. Born in California, October 9, 1922. Observed by us in May, 1931, in ungraded class, Oakland, Calif., city schools. Lloyd was doing somewhat better than Floyd. Mental tests in 1928 revealed for Floyd, I.Q. 78, for Lloyd, 87.

Case 69. M. twins, Alex and Tom. Born in Edmonton, B. C., Canada, May 12, 1917. Alex was the first-born, labor in his case being precipitate, within three hours of mother's arrival at the hospital and before the physician could get there. He was "a blue baby" with "face all mashed in". Mental test in his case in 1926 revealed I.Q. 32. He has never gone to school, is kept at home. No results of mental tests in Tom's case are available, but he is obviously of normal intelligence, has done well at school and, at the time of our observation of the case, which was in May, 1931, he was in the eighth grade at the public schools at Vancouver, B. C., and on the promotion list to go to high school.

Group 6. Uncomplicated mental deficiency; one affected; females. Four cases, 70-73.

Case 70. G. twins, Josefina and Gonzales. Indian or part-Indian. Born in Santa Monica, Calif., March 18, 1923. Observed by us in the Santa Monica city schools in December, 1931. Mental tests in 1930 revealed, for Josefina, I.Q. 79, for Gonzales, 93.

Case 71. B. twins, Loretta and Lorraine. Born in Los Angeles, May 10, 1911. Observed by us in December, 1931, in the Venice, Calif., high school. Mental tests in 1926 revealed, for Loretta, I.Q. 78, for Lorraine, 99.

Case 72. M. twins, Vera and Helen. Born in Berkeley, Calif., July 29, 1914. Observed by us in the Berkeley city schools in March, 1932. Mental tests in 1930 revealed, for Vera, I.Q. 75, for Helen, 85.

Case 73. C. twins, Carolyn and Mary. Born in New York, November 11, 1916. Carolyn has always done poorly at school and since 1928 has been in the Bellevue School for subnormal children in Los Angeles. Mental tests in 1928 revealed I.Q. 67.—Mary has made approximately normal progress in her studies and, at the time of our observation of the case, which was in April, 1931, was in the eighth grade. Mental test in her case revealed I.Q. 91.

Group 7. Mental deficiency complicated with infantile palsies; males. Two cases, 74-75.

Case 74. H. twins, Ray and Roy. Born in Alhambra, Calif., November 6, 1922. Birth was premature, at 7½ months. Ray was the first-born and the midwife had to "pull and twist" his head to assist in the delivery. He was unable to sit up until the age of 3½ years; could not talk at all until recently; now (December, 1931) talks a little; is left-handed; and has residuals of congenital right spastic hemiplegia; wets his clothes. He has never been able to go to school and is tutored at home by a visiting teacher. Mental test in February, 1932, revealed I.Q. 69.—Roy has always been normal mentally and physically, is right-handed, goes to school. Mental test in January, 1931, revealed I.Q. 118.

Case 75. K. twins, John and Lewis. Born in New York, December 31, 1912. Birth was premature, at the end of the eighth month. Delivery was difficult, John, the first-born, being extracted by podalic version, Lewis by high-forceps operation. They were admitted together to the Children's Hospital and School, Randall's Island, N. Y., April 26, 1918. John was diagnosed as "below-test idiot"; mental test in 1923 revealed for Lewis, I.Q. 11. John was found, on admission, to have flaccid praalysis of both lower extremities with atrophy—probably due to cord injury at birth. He died following sudden collapse while eating on July 27, 1920. Lewis died January 5, 1931, of bronchopneumonia with empyema.

Group 8. Mental deficiency complicated with infantile palsies; females. Five cases, 76-80.

Case 76. B. twins, Edna and Eva. Born in Scottsdale, Pa., May 25, 1899. Admitted together to Polk State School, Pa., March 10, 1910. At the time of our observation of the case, which was in August, 1931, they were still inmates there. Edna has a congenital right hemiplegia, Eva a spastic paraplegia. Mental tests in 1928 revealed, for Edna, I.Q. 42, for Eva, 36.

Case 77. C. twins, Francina and Lena. Born in New York, June 1, 1915. They were "seven-month babies", weighed 3½ pounds each. Both have large heads and spastic paraplegia, the latter more marked in Francina. Lena alone has internal strabismus of left eye. They have five singly-born siblings, all normal and attending school. They were admitted together to Children's Hospital and School, Randall's Island, N. Y., July 6, 1923. At the time of our observation of the case, which was in July, 1931, they were still inmates there. Mental tests in 1921 revealed, for Francina, I.Q. 40, for Lena, 36.

Case 78. R. twins, Mildred and Bernice. Born in Pittsburgh, Pa., December 4, 1926. Admitted together to the Polk State School, Pa., December 9, 1930. At the time of our investigation of the case, which was in August, 1931, they were still inmates there. At that time neither twin had either walked or talked. Bernice was the first-born by breech delivery, has spastic paraplegia. Both had convulsions when 10 days old. Mental tests in December, 1930, revealed, for Mildred, I.Q. 37, for Bernice, 25.

Case 79. D. twins, Madeline Frances and Mary Gertrude. Born in Boston, October 12, 1928. Admitted together to the Monson State Hospital, Mass., for epileptics, October 7, 1931. At the time of our observation of the case, which was in August, 1932, they were still inmates there. There is no record of mental tests, but both show marked mental deficiency: at the age of nearly 4 years Mary Gertrude has not yet talked at all, while Madeline Frances was able to say only a few brief phrases, such as "good girl", etc. Both have congenital left-hemiplegia. Both also have epilepsy which began, in Mary Gertrude at the age of 16 months and, in Madeline Frances, at 19 months.

Case 80. O. twins, Ruth and Esther. Born in New York, May 27, 1927. Their mother was very sick throughout pregnancy with them. The twins weighed $4\frac{1}{2}$ pounds each at birth. Both are microcephalic; also both began to have epileptic convulsions at the age of 1 year at the rate of about once in two months. Ruth had congenital spastic paraplegia, but not Esther. They were admitted together to the Children's Hospital and School, Randall's Island, N. Y., December 15, 1930. Ruth died on December 26, 1930; Esther on January 21, 1931, both of bronchopneumonia. There is no record of mental tests, but both were diagnosed as "below-test idiocy".

Group 9. Mental deficiency complicated with epilepsy; males. Four cases, 81-84.

Case 81. J. twins, Chester and Edward. Born in New York, September 8, 1922. Our observation in March, 1931, in New York city schools. Chester was then in a "slow-moving group" in grade 2B, Edward in an "ungraded class." Edward is left-handed and presents a history of epileptic seizures, Chester is right-handed and free from seizures. Mental tests made, respectively, in 1929 and 1930, revealed, for Chester, I.Q. 79, for Edward, 64.

Case 82. L. twins, William S. and Robert T. Born in Spokane, Wash., October 9, 1916. Birth was premature, at end of eighth month; mother fell down stairs, labor started next day; eclampsia set in necessitating immediate extraction by high forceps operation. Both twins had severe head injuries at birth. Both are congenitally blind; ophthalmoscopic examination reveals optic nerve atrophy. Both have had epileptic seizures since the age of 3 years. No record of mental test, but both are obviously mentally deficient. William S. was admitted to the California School for the Blind, September 6, 1932, and, at the time of our observation of the case which was in November, 1932, plans were under way to have Robert T. placed there also.

Case 83. D. twins, Archibel and Manchester. Born in St. Helms, Ore., January 1, 1919. At the time of our observation of the case, which was in June, 1931, six of the fifteen children of the family, including the twins, were inmates in the Oregon State Institution for the Feeble-minded at Salem, the twins having been admitted there August 6, 1924. Of the remaining children two presented a history of epilepsy, but had not been institutionalized. The mother was then in the state insane hospital where she had given birth to her

fifteenth child. The father was in the state penitentiary. Both twins developed epilepsy at the age of $1\frac{1}{2}$ years. Mental tests in 1924 revealed, for both, I.Q. 30.

Case 84. F. twins, Edwin and Oliver. Born in Los Angeles, January 8, 1924. Oliver was the first-born and was somewhat larger than Edwin. They both walked at 12 months, talked at 15 months, and developed normally up to 3 years of age. At that time Edwin "had a severe case of indigestion with locked bowels for three days, which was followed by convulsions occurring daily to as many as 15 times for a period of a month". Since then he has not talked; epileptic seizures have occurred about once a month and are usually mild. He has been taught to take care of himself in the toilet, but is not otherwise teachable.—Oliver is in school, doing average work. Mental test in 1930 revealed I.Q. 99. He is in good health and up to the time of our observation of the case, which was in April, 1931, had been free from epileptic manifestations of any kind.

Group 10. Mental deficiency complicated with epilepsy; females. Three cases in Group 8—78, 79, and 80—present, as complications, not only infantile palsies, but also epileptic manifestations. In addition we present, in this group, 7 other cases complicated with epilepsy, 85–91.

Case 85. S. twins, Margaret and Marion. Born in Clarence, N. Y., January 29, 1919. Birth was at full term and normal; they weighed, respectively, $5\frac{1}{4}$ and $5\frac{3}{4}$ pounds. At 9 years epileptic seizures began in both and have since occurred at the rate of two or three a week. They were admitted to the Craig Colony for epileptics at Sonyea, N. Y., April 17, 1930. At the time of our investigation of the case, which was in April, 1931, they were still inmates there. Mental tests in 1930 revealed, for Margaret, I.Q. 71, for Marion, 68.

Case 86. R. twins, Eileen and Isla. Born in Hamilton, Ont., Canada, March 22, 1922. Birth said to have been normal. Both twins have been treated in the out-patient department of the Toronto Psychiatric Hospital since July 8, 1932. Eileen is left-handed, Isla right-handed. Both are cross-eyed. Both are heavy sleepers, have enuresis, and are subject to petit-mal and grand-mal seizures. Mental tests in 1929 revealed, for Eileen, I.Q. 68, for Isla, 64.

Case 87. P. twins, Olga and Rose. Born in New York, May 27, 1913. Both parents are illiterate, heavy drinkers, and mother is feeble-minded and an inmate of Letchworth Village, Thiells, N. Y. Both twins were admitted to the Children's Hospital and School, Randall's Island, N. Y., November 18, 1920; they remained there until May, 1930, when they were transferred to Letchworth Village. At the time of our observation of the case, which was in July, 1931, they were still inmates there. Olga has left internal strabismus and increased knee-jerks, but is free from epilepsy. Rose, on the other hand, has had frequent epileptic seizures since the age of seven years or before. Mental tests in 1927 revealed, for Olga, I.Q. 38, for Rose, 31.

Case 88. E. twins, Blanche and Maud. Born in Florida in 1895. Seizures began in both at the age of 7 months and have occurred ever since at intervals varying from one week to three months; they are both petit-mal and grand-mal. The twins were admitted to the State Hospital for Epileptics at Abilene, Tex., February 21, 1911. At the time of our observation of the case, which was in June, 1932, they were still inmates there. There is no record of mental tests, but the twins are obviously of very defective intelligence, although it would be impossible to state at this time to what extent their case is one of original mental deficiency and to what extent one of acquired epileptic deterioration.

Case 89. B. twins, Edjuana and Juanita. Born in Los Angeles, February 29, 1916. Edjuana was the first-born; delivery was difficult and instruments were used, injuring the head and leaving a severe cut on one side of the face. Her weight was 3 lbs. 8 ozs. She began to have convulsions at the age of 4 years; they occurred almost daily up to the age of 11 years. Since then they have been infrequent, but she has "violent spells" at the menstrual periods. She went to school at 7 years, but eventually had to be transferred to a "development school". She left school at 15 years, when she was still doing second grade work. Edjuana became troublesome in behavior; she would run away from home and be gone over night; was restless, irritable, and at times threatening. She also developed psychotic symptoms: said people had it in for her, told of imaginary attacks, and was unstable emotionally, being at times depressed, at others hilarious, and at still others tempestuous and violent. Occasionally she would be seen standing in an awkward position for an hour at a time. She finally became so unmanageable that on May 23, 1932, she was placed in Pacific Colony (state institutions for the feeble-minded) at Spadra, Calif. At the time of our observation of the case, which was in September, 1932, she was still an inmate there. It was judged that she was not only feeble-minded to begin with, but also had suffered some mental deterioration in the course of her epilepsy and psychotic disease. A mental test in 1931 revealed I.Q. 28.—Juanita was born without difficulty and without use of forceps. She weighed 4 pounds. There was no evidence of injury at birth. At the time of our observation of the case, she was in the ninth grade at school, was in good health both mentally and physically, had never had a seizure, and presented no psychotic symptoms or behavior difficulty.

Case 90. L. twins, Louisa and Rose. Born in Haverhill, Mass., of Italian parentage, August 6, 1909. At the age of 14 years Louisa began to have epileptic seizures. Gradually thereafter she seemed to deteriorate mentally and there developed difficulties in behavior; she would go out at night with men and stay until 2 a.m.; the parents could no longer control her as she would have outbursts of temper, spit in her mother's face, and threaten to turn on the gas and kill every one in the house. On May 29, 1930, she was committed to the Reformatory for Women at Framingham, Mass. While there she had some seizures and was therefore transferred on January 25, 1932, to the Monson State Hospital for Epileptics, at Palmer, Mass. At the time of our observation of the case, which was in August, 1932, she was still an inmate there. The diagnosis at this institution was epilepsy with mental deficiency. A mental test in 1932 revealed I.Q. 50. However, it would be impossible to say at this time to what extent this was attributable to original mental deficiency and to what extent to epileptic deterioration.—Rose never developed epilepsy. At first her trouble consisted in severe headaches, said to be of migrainous type, occurring just before the menstrual periods. Gradually she, too, became hard to manage, wanted to go out at night, and quarreled with her parents. On one occasion she cut off her hair when her parents refused to permit her to have it bobbed. Friction with the parents increased; she became stubborn, and finally refused to go to work. In the latter part of August, 1926, she suddenly developed psychotic symptoms. An adjoining house had caught fire during the night. She was terrified and ran to the window calling "Fire!" "Police!" From that time on psychotic symptoms persisted; she was greatly disturbed, and, on September 11, 1926, was committed to the state hospital at Danvers, Mass. There she showed rapid deterioration both mentally and physically. A case note in the spring of 1928 stated: "Quiet, indifferent, has to be dressed, eats poorly, at times has to be tube-fed, does not answer when

addressed, never speaks except to mutter to herself in Italian". She died in the hospital on May 8, 1928, of pulmonary tuberculosis. The hospital diagnosis of the mental condition was dementia praecox.

Case 91. W. twins, Mary and Gertrude May. Born in Worcester, Mass., April 1, 1894. They are the illegitimate offspring of a woman who was probably feeble-minded, an inmate of the Worcester Home Farm until her death. They were given to the Sisters of Mercy who arranged for their separate adoption while they were still infants. As they matured, each got into trouble repeatedly, mainly on account of sexual promiscuity with illegitimate pregnancy, etc. Gertrude May was in and out of the House of the Good Shepherd; finally they both were committed to the Massachusetts Reformatory for Women at Framingham, Gertrude May on July 22, and Mary on August 22, 1914. They came under different names and it was not known either to them or to the institution staff that they were related. They were, however, identical in appearance and behavior to such an extent as to be quite indistinguishable. Later their origin was traced and it was found that they were twin sisters. Although there is no record of any mental test, they were recognized as feeble-minded. They also were observed occasionally in epileptic seizures.—Gertrude May was released from the reformatory on July 3, 1916, but could not adjust herself outside. She was in the Worcester Home Farm for two brief periods in 1917, left there in November of that year, is said to have married in 1918, and has not been heard from since.—Mary was released from the reformatory on August 21, 1916, but she, too, could not adjust herself outside and, on November 2, 1916, was placed in the Worcester State Hospital; a year later she was transferred to Foxborough State Hospital where she remained until April 17, 1918. There she was found to have mental deficiency without established epilepsy and without psychosis and was, accordingly, transferred to the Worcester Almshouse. At the time of our investigation of the case, which was in August, 1932, she was still an inmate there.

Group 11. Mental deficiency complicated with psychotic disease; males. Four cases, 92-95.

Case 92. Z. twins, Peter and Alexander. Born in New York, September 19, 1915. Observed by us in July, 1931, through the courtesy of the Institute for Child Guidance, New York, and the Bureau of Attendance, New York city schools.—Peter has had great difficulty with reading and writing and is retarded at school by nearly 3 years. Mental test in 1928 revealed I.Q. 75. He has presented also persistent behavior difficulty: frequent truancy, temper tantrums in class, described by principal as "liar, proud of his bad record"; expelled from his school as incorrigible and has since been in a special school for problem boys and on probation in charge of attendance officer. He was also a sex delinquent on a grand scale. He was one of a group of boys who had a *rendez-vous* in Central Park where they would bring a girl and all have sexual relations with her. In this way, he claimed, he had had relations with more than 30 girls.—In Alexander's case mental deficiency is not factor. A mental test in 1927 revealed I.Q. 95. At the time of our observation of the case he was in the 7A grade. He, too, however, presented behavior problems: a frequent truant, on probation in charge of probation officer; many sex delinquencies, both with boys and with girls, some of them in company with Peter. Also, following his mother's death he had a transient psychotic episode: when the undertaker was about to remove the coffin containing her remains, Alexander objected to it, created a scene, struggled with the undertaker, threw a bottle at his head, is described as having been "a little off" since then.

Case 93. P. twins, Reno and Joe. Born in Oakwood, Calif., September 22, 1925. At the time of our observation of the case, which was in April, 1932, they were in the first grade in the Dewey School, Oakland. They had spent 3 terms in the kindergarten; in class they "just stand around", being extremely shy. The kindergarten teacher said she had not heard either of them speak once during their 3 terms there. They appropriate anything they can lay their hands on; if spoken to they become frightened and cry or run off. They take no interest in anything that goes on about them. A Pintner-Cunningham test in January, 1932, revealed, for Reno, score 6, for Joe, 9; *i.e.*, both in "Group E", corresponding to I.Q. below 70. We have classified the case as one of mental deficiency complicated with schizoid traits and behavior difficulty.

Case 94. T. twins, Alfred and Arthur. Born in Kansas City, Mo., November 5, 1900. There is no record of any mental test prior to the onset of psychotic symptoms. Both twins, however, were regarded as subnormal in intelligence, did very poorly at school, advancing scarcely as far as the fourth grade. They sold newspapers and did odd jobs until their psychoses developed.—In October, 1922, Alfred came home one day and announced, "Either I am going crazy or everyone else is." He packed all his clothes, took them out of the house, and came back without them, saying he did not need clothes or money any more. He was committed to the state hospital at Patton, Calif., November 7, 1922, and at the time of our observation of the case, which was in November, 1930, he was still an inmate there. At the hospital he said, "Everybody hears voices, I hear them over the telephone, God is right here, wireless is in the air, it is just like throwing your voice, mind with mind." A recent case note (August, 1930) states: "Laughs and talks to himself; somewhat rambling and disconnected." The hospital diagnosis at first was mental deficiency with psychosis, later changed to dementia praecox.—The psychosis in Arthur's case developed without apparent cause in October, 1924. He slashed his wrists, chest, and abdomen without any warning or explanation, and was taken to the Emergency Hospital in San Francisco. When the wounds healed he came home, but, being obviously psychotic, was committed to the state hospital at Patton, Calif., November 30, 1924. At the time of our observation of the case (1930) he was still an inmate there. At the hospital he said he heard many strange voices, they told him to do things, told him to commit suicide. He did not want to be molested. Case note in January, 1929, states: "Has periods of being disturbed and irritable, has many delusions, says he is Jesus Christ." The hospital diagnosis was dementia praecox, paranoid type. Evidence in the history of his case, too, indicates a basis of mental deficiency.

Case 95. B. twins, Dodridge and Mack. Negro boys, born in Parksville, Ala., February 7, 1907. Although they were physically identical and there was only one placenta at birth, they have always been quite different in temperament: Mack excitable, impatient, irritable; Dodridge slow, phlegmatic, steady, conscientious. They both did poorly at school, left at 14 years, when Mack had reached the fourth grade and Dodridge the sixth.—Dodridge has never had psychotic trouble. A mental test in 1930 revealed I.Q. 55. In spite of this handicap he has been employed for years as an attendant in a billiard parlor, earned good wages and tips, went in for many clothes, even expensive ones, and was "a credit to the family."—When the twins were 22 years old they and their older sister became interested in spiritualism. From that time on Mack's psychosis developed gradually. He went much more deeply into the study of spiritualism than did either his brother or his older sister. Soon he became definitely psychotic, drew the shades in the house, locked the doors, begged Dodridge not to leave the house, fearing to be alone, lest someone come

in and shoot him. He saw prophets riding through the sky, heard "sweet voices," laughed and talked to himself. He began to fail physically, lost a great deal of weight, and on September 15, 1929, was placed in the City Hospital, Cleveland, Ohio. He remained there until the end of April, 1930, when, having shown no improvement, he was committed to the Cleveland State Hospital. There his mystic delusional trend continued, he was seen at times falling into a stupor, lying stiff and speechless, with eyes closed. After several months he began to show improvement and on December 8, 1930, he was given a trial at home. At the time of our investigation of the case, which was in the latter part of December, 1930, he was at home in an improved condition. The hospital diagnosis was dementia praecox, catatonic type. A mental test in December, 1930, revealed I.Q. 49. It is a question, to what extent this result was attributable to original mental deficiency, and to what extent to psychotic incoöperation and deterioration.

Group 12. Mental deficiency complicated with psychotic disease; females. Two cases in Group 10, 89 and 90, present as complications not only epilepsy but also psychotic disease. In addition we present, in this group, 2 other cases, complicated with psychotic disease, 96-97.

Case 96. G. twins, Julia and Julie. Born in 1897, exact date and place unascertained. At the time of our investigation of the case, which was in August, 1930, they were in the East Louisiana State Hospital at Jackson, where they had been for 5 years. There is no record of mental tests, but they were obviously of defective intelligence, illiterate, without occupation. The hospital diagnosis in both twins was dementia praecox, paranoid type.—Case notes in Julia's clinical records state: "Violent, destructive, excited. Attempted suicide. Talks to herself; believes that she is being poisoned. Thinks automobiles are hearses and they are trying to bury her." "Shortly after admission she was moved away from her sister and then became quiet. She has been furloughed but never able to adjust herself on the outside. At the present time (1930) she is quiet, causes no trouble, gets along well on the ward with the other patients."—Case notes in Julie's clinical records state: "Believes she is being poisoned; believes automobiles are hearses and they are trying to bury her. Careless in dress, excited, destructive, pugnacious at times, and exhibits many mannerisms." "Furloughed several times, but not able to adjust on the outside. Adjusts very well to hospital routine."

Case 97. B. twins, Emma and Katherine. Born in Zelienople, Pa., in 1870. They had always been cared for at home, doing chores. Emma, as she grew older, gradually became troublesome and unmanageable at home until finally, on November 20, 1927, she was committed to the state hospital at Dixmont, Pa. At the time of our observation of the case, which was in September, 1931, she was still an inmate there. Mental test at the hospital revealed I.Q. 44. The hospital diagnosis was mental deficiency with psychosis.—Katherine has always been somewhat brighter and more amenable and has remained at home. There is no record of a mental test in her case, but it is judged that her mental deficiency is in the lower grades of moronism. She has presented no psychotic symptoms or serious behavior difficulty.

Group 13. Mental deficiency complicated with child behavior difficulty; males. Cases 92 and 93, in Group 11, present, as complications, not only psychotic manifestations, but also behavior difficulty. In addition we present, in this group, 6 other cases complicated with behavior difficulty, 98-103.

Case 98. P. twins, Manuel and Tony. Born in Berkeley, Calif., December 13, 1921. These boys have been extremely troublesome since they were

6 years old, or before; throwing rocks through windows of passing trains; cutting tires of parked automobiles; breaking windows and entering the school building in the evening; reported to the police as missing children; stealing a watch and other articles and hiding them by burying in the garden; stealing marbles from show case in store; stealing articles from unlocked automobiles parked in the street; getting other boys involved in their escapades, etc. They said, "The police can't do nothing to you anyway." At the time of our observation of the case, which was in August, 1932, they were wards of the Juvenile Court and under the supervision of the Berkeley Police Department. Mental tests in 1929 revealed, for Manuel, I.Q. 75, for Tony, 80. Tony seemed to be the leader.

Case 99. H. twins, Darl Martin and Dale Merton. Born in Pennsylvania June 29, 1916. Parents were divorced in 1923 and the twins were placed in the Fairmont Children's Home at Alliance, Ohio, where they remained until October, 1924. Since then Dale has lived with his father and Darl with his mother. They went to the same school, however, played hookey a great deal. They were practically indistinguishable and have used this fact to deceive teachers and police and probation officers. While at the children's home in Alliance, Darl stole a pocket-book containing \$1.35. Dale seems to be the more markedly delinquent; he was first in court at 11 years for stealing \$20; since then he has been in court 11 times, usually for stealing; described as a nuisance to the police, teachers, etc.; expelled from school twice; burglarized a gas station, robbed a drug store, turned in a false fire alarm, "not satisfied unless causing trouble." In April, 1927, the twins, together with some other boys, stole a pocket-book containing \$40. In May, 1927, Darl stole \$20 from a filling station. Later in the same month the twins ran away together, were located in Barberton, Ohio, brought back, and on June 22, 1927, were committed to the Boys' Industrial School at Lancaster, Ohio. On March 17, 1928, Darl was paroled, but had to be returned on April 5, 1929, this time remaining until April, 1930. Dale was paroled on March 17, 1929, but had to be returned on March 12, 1932. At the time of our observation of the case, which was in July, 1932, he was still an inmate there. Mental tests made, respectively, in 1927 and 1932, revealed, for Darl, I.Q. 75, for Dale, 71.

Case 100. B. twins, Henry Clay and Milton Ray. Born in California April 19, 1915. Father intemperate; mother developed a psychosis during pregnancy with her last child in 1918, was in Patton State Hospital, California, for 9 months, discharged as recovered; parents were later divorced and mother remarried. During the pregnancy with the twins mother is said to have weighed only 80 lbs.—Birth of the twins was difficult but not instrumental, both by breech presentation, Henry Clay weighed 5 lbs., Milton Ray, 4 lbs. Henry is right-handed, Milton, left-handed. The twins did poorly at school, were in special classes and development rooms, showed increasing "emotional instability," and finally became so troublesome that they were expelled. They were also troublesome and difficult to manage at home, and were first brought into Juvenile Court by their father in November, 1927. In November, 1932, they were again in court, this time on a charge of grand theft (Buick car). They were placed on probation, but in February, 1933, were brought up again on a charge of petty theft (stealing \$60 worth of tools from an automobile). They were committed to Pacific Colony (state institution for the feeble-minded) at Spadra, Calif., on April 5, 1933. At the time of our observation of the case, which was in June, 1933, they were inmates there. Mental tests in 1929 revealed, for Henry Clay, I.Q. 65, for Milton Ray, 59.

Case 101. B. twins, Ralph and Mike. Born in Italy, September 29, 1905. There has been a marked difference between the twins in intelligence, temperament, and behavior since childhood, although they are identical physically.—Ralph was a persistent truant from school, reached only the fourth grade, has never worked steadily, is described as "shiftless, a floater, hobo type." He deserted from the Italian Army, later came to this country. Arrested twice in Bridgeport, Conn., in 1928, for vagrancy, first time given probation, second time sentenced to the city jail for 9 months. On July 7, 1930, he was sentenced, for assault and battery with intent to rape, to Western State Penitentiary, Pittsburgh, Pa., for $2\frac{1}{2}$ to 5 years; escaped October 26, 1931, recaptured the same day, re-sentenced to serve additional $2\frac{1}{2}$ to 5 years in the penitentiary. At the time of our investigation of the case, which was in July, 1932, he was still an inmate there. A mental test in 1930 revealed I.Q. 58.—Mike seems normal in intelligence, although there is no record of any mental test. He got along well at school, has always worked steadily as a stone mason, served 2 years in the Italian army without trouble, later came to this country, has been free from criminal tendency.

Case 102. D. twins, Harold and Vincent. Born in Albany, N. Y., June 14, 1914. They were brought up in orphanages and children's homes and were described as mischievous, troublesome children; did very poorly at school.—In 1930 Harold began to issue bad checks in small amounts and was finally committed to the reformatory at Elmira, N. Y., October 27, 1930. From there he was transferred on March 25, 1931, to the Institution for Defective Delinquents at Napanoch, and was still there at the time of our observation of the case in November, 1932. A mental test in 1931 revealed I.Q. 53.—Vincent was never convicted as a delinquent, but is emotionally unstable, quarrels constantly with his mother and insults her, runs away from institutions, once attempted suicide by taking poison. In the early part of 1931 he developed pulmonary tuberculosis and spent some months in 2 sanitariums. There is no record of any mental test in his case, but his intelligence has been estimated as on the level of high grade moronism.

Case 103. G. twins, John and George. Born in Rockwood, Ont., Canada, April 21, 1916. Parents were cousins, father intemperate. Birth instrumental. Twins were always together; associated only with each other; both have a record of persistent truancy from school. They had been before the courts 3 times for stealing and finally, on August 29, 1929, were committed to the Victoria Industrial School at Mimico, Ont. From there, on December 2, 1931, they were transferred to the Ontario Hospital (for the feeble-minded) at Orillia. Their behavior at Mimico was not satisfactory, but since admission to Orillia they have been reported as obedient and not difficult to manage. Mental tests in 1930 and 1931, respectively, revealed, for John, I.Q. 53, for George, 47.

Group 14. Mental deficiency complicated with child behavior difficulty; females. Three cases in Group 10—89, 90, and 91—present, as complications, not only epilepsy, but also behavior difficulty. In addition we present, in this group, 3 other cases complicated with behavior difficulty, 104–106.

Case 104. McG. twins, Mary and Felicita. Part-Indian. Born in Los Angeles January 25, 1915. Both have done poorly at school partly by reason of subnormal intelligence, partly on account of lack of interest in studies and persistent truancy; both have had to be transferred to the "Welfare Center" (special school for problem children in Los Angeles). Mental tests in 1929 revealed, for Mary, I.Q. 79, for Felicita, 77.—Shortly prior to our

observation of the case, which was in October, 1932, Mary, after one of her absences, was taken to the school clinic and found to be three months pregnant. The boy who was responsible for this was apprehended and forced to marry her, but he soon left her and she went to live with her uncle; baby due soon.—Felicita also became involved with a boy and was married 6 months after her placement in the "Welfare Center."

Case 105. T. twins, Mary and Martha. Negro girls. Born in Florida in November, 1918. Observed by us in September, 1932, in "Development Center" (special school for problem children in Los Angeles), to which they had been transferred a year previously partly on account of poor progress in studies, partly because of behavior difficulties. Mental tests in 1931 revealed, for both, I.Q. 77. Described by teachers as "dirty, untidy, untruthful"; they have a record for fighting which makes them a continual cause of class room disturbance and for which they had been expelled from their school. They also have a record of persistent truancy. There was also sex delinquency and they were being almost regularly picked up by the police in the streets at night. They are never seen apart, both are generally in the same trouble at the same time.

Case 106. F. twins, Thelma and Wilma. Born in Sedalia, Mo., July 25, 1917. Observed by us in January, 1932, in Terrace Union School, Colton, Calif. They present, in intelligence, educational progress, and behavior, a marked contrast in comparison with other members of their family. A younger sister has an I.Q. of 125 and is a charming girl in every way. They are doing very poorly in their studies. Mental tests in 1931 revealed, for Thelma, I.Q. 71, for Wilma, 64. Both stammer badly, especially Wilma. Their teacher in the small country school considers them the greatest problem there. They are overdeveloped physically and "boy-crazy," and make themselves obnoxious in the neighborhood because of this. Whenever reprimanded in any way or foiled in their plans they cry loudly and long—usually have 1 or 2 such spells daily. They are quite inseparable.

Group 15. Mental deficiency complicated with juvenile delinquency; males. The 6 cases in Group 13, 98-103, presented, as complications, not only child behavior difficulties, but eventually also juvenile delinquency, i.e., they had juvenile court records. We present, in this group, 12 other cases, 107-118.

Case 107. C. twins, Robert and Richard. Born in Brantford, Ont., Canada, September 13, 1910. In this case the behavior difficulty seems to be attributable not only to constitutional factors, but also to bad influences in the home. The father is a heavy drinker and has "a bad moral reputation." The mother has 2 court records for stealing and shoplifting. There is no record of mental tests in the twins, but they are described as "below par mentally." Robert has been in court twice prior to 1926 for stealing in conjunction with his mother, and Richard has been known to the police as "incorrigible." They were committed on complaint of the Brantford Chief of Police on February 28, 1926, to the Victoria Industrial School at Mimico, Ont.—Robert remained there until May 27, 1929, when he was placed in his sister's home and given a job in a canning factory. Later he went to work for a roofer and helped his sister. At the time of our observation of the case, which was in August, 1932, he was getting along very well at home and at his work.—Richard was released from the institution on March 10, 1930, when he was indentured to a farmer in Streetsville, Ont. At the time of our observation of the case he was still there, well adjusted in every way, had "a first class reputation as a helper."

Case 108. W. twins, Fred and Edward. Negro boys. Born in Montclair, N. J., January 22, 1916. There were 8 other children in the family ranging in age from 8 to 27 years. Home influences were good and their delinquencies were attributed to bad associations with some Italian boys in the neighborhood. They were somewhat retarded in school, having reached the fifth grade at 12 years; played hookey occasionally. They were always together and were in trouble together. Their first arrest was on November 4, 1927, for breaking and entering, but the complaint against them was dismissed at that time. On December 21, 1927, they were arrested again, charged with 6 counts of larceny, and this time they were committed to the State Home for Boys at Jamesburg, N. J. There they remained until August 23, 1929, when they were paroled to the custody of their mother. At the time of our investigation of the case, which was in June, 1931, their behavior on parole had been excellent in every respect. Mental tests in 1928 revealed, for Fred, I.Q. 79, for Edward, 83.

Case 109. A. twins, Frank and Edward. Born November 2, 1906, place of birth unascertained. The record of delinquencies in Frank's case dates back to the age of 10 years, beginning with truancy, breaking and entering, and larceny. By the time he was 20 he had been brought before the courts on 12 charges. Edward first came to the attention of the courts at the age of 17 years on a charge of assault and battery and, by the time he was 20, he had been brought up on 4 charges. On February 26, 1926, they were both sentenced for 7 to 10 years to the Massachusetts State Prison for assault with intention to rape, being involved together in the same offenses. Later, on account of their youth, they were transferred to the Massachusetts Reformatory. At the time of our investigation of the case, which was in September, 1930, they were still inmates there, but were to be released in the near future. Mental tests in 1926 revealed, for Frank, I.Q. 79, for Edward, 80.

Case 110. L. twins, Harold and Howard. Born in Washington, N. J., February 7, 1910. The father is alcoholic; an older brother has been in a boys' home in Trenton; a younger brother is a persistent truant, has a Juvenile Court record.—The twins have always been together. They did poorly at school, left at the age of 14 years, having reached the fourth grade. Their delinquencies began shortly after leaving school and consisted at first in running away from home. For this they were arrested twice and placed on probation, but in November, 1925, were brought again before Juvenile Court: they had run away again, joined a circus, traveled with it as far as Hollywood, Calif.; parents testified that they had been "disobedient and incorrigible." Accordingly, on December 5, 1925, they were committed to the New Jersey State Home for Boys at Jamesburg. From that time on they no longer had opportunity of acting jointly, but their delinquencies continued separately.—Harold was paroled from Jamesburg on May 16, 1927; returned for violation of parole on July 12, 1927; escaped August 16, 1927; picked up within a few days and sent to the State Reformatory at Rahway; paroled from there in December, 1929. In February, 1930, he was arrested for robbery and re-committed to the Rahway reformatory.—Howard was paroled from Jamesburg on September 27, 1927; within a few days he was arrested for stealing an automobile, and on April 20, 1928, was committed to the State Reformatory at Rahway; paroled from there in the spring of 1930, but was soon arrested again for breaking, entering, and larceny, and, on November 13, 1930, was sentenced to the State Prison at Trenton. From there he was transferred back to the Rahway reformatory in January, 1931.—At the time of our investigation of the case, which was in July, 1931, both twins were still at the Rahway reformatory. Mental tests in 1926 revealed, for Harold, I.Q. 79, for Howard, 67.

Case 111. J. twins, Isaac and Arthur, Negro boys. Born in Orange, N. J., May 6, 1908. In this case the delinquency seems to be attributable, at least in part, to an unsatisfactory situation in the home. The mother deserted the family when the twins were still babies; the father died a few years later, and they were brought up by a paternal aunt. This aunt is reported to have scolded and whipped them frequently and otherwise ill-treated them. They did poorly at school, repeated grades, played hookey, reached the fifth grade by the time they were 14 years old. In Arthur's case there is a record of an arrest, prior to 1922, for breaking, entering, and larceny, but he denied his guilt. They were both committed to the State Home for Boys at Jamesburg, N. J., on June 2, 1922, for "incurability." In 1923 the twins were paroled to the custody of their aunt, Arthur on July 10 and Isaac on October 25. In January, 1925, on account of renewed friction with their aunt, they ran away from her home and found for themselves work and a home on a farm. The parole officer, upon investigation, allowed them to remain in this new placement. Since then they have made a satisfactory adjustment up to the time of our investigation of the case, which was in May, 1931. Mental tests in 1922 revealed, for Isaac, I.Q. 78, for Arthur, 80.

Case 112. S. twins, Raymond James and Rodney. Born in Akron, Ohio, February 22, 1916. These twins belong to a family noted for delinquency and criminality. Two older brothers are in the Boys' Industrial School at Lancaster, Ohio, and another is in the Mansfield Reformatory.—Raymond James was first brought into court at the age of 11 years for stealing money. He has been in court on 9 occasions since for stealing money and bicycles. He has 6 bicycle thefts on his record. The twins usually work together and use their identical appearance for establishing alibis for each other. Raymond was committed to the Boys' Industrial School December 14, 1929; paroled January 20, 1931; resumed his thefts and was returned to the institution October 15, 1931. At the time of our investigation of the case, which was in July, 1932, he was still an inmate there. Mental test in 1931 revealed I.Q. 77.—Rodney was in court for stealing 4 times in 1929 and 1930, the last time for stealing an automobile. Like other members of his family, he is proud of his record as a thief. Says he has stolen several bicycles and not been caught. Defies them to catch him. Seems to hate everybody except his twin. He was committed to the Boys' Industrial School November 8, 1930, paroled July 3, 1931, returned together with Raymond October 15, 1931. Mental test in 1930 revealed I.Q. 73.

Case 113. W. twins, Calvin and Alvin. Negro boys. Born in Ohio, August 14, 1919. Both presented a behavior problem in the nature of petty thefts and on August 16, 1929, were committed to the state institution for the feeble-minded at Columbus, Ohio. On November 15, 1929, they were transferred to the state institution for the feeble-minded at Orient. At the time of our investigation of the case, which was in August, 1932, they were still inmates there. Mental tests in 1929 revealed, for Calvin, I.Q. 76, for Alvin, 74.

Case 114. N. twins, Joseph and Hyman. Born in London, England, November 5, 1910. These boys began to be very troublesome at home at the age of 10 years or before, especially Joseph, who has always been "by far the worse of the two." They had been ungovernable, would steal money at home and run away for days or weeks at a time, associating with pickpockets.—Joseph was committed to Children's Village, New York City, on March 15, 1922, and remained there until September 8, 1922. Within a few weeks he stole \$10 from his father and ran away from home, and on October 16, 1922, he had to be placed in the Jewish Protectory at Hawthorne, N. Y., where he

remained until June 18, 1924, when he was paroled. He then got along fairly well until April 13, 1927, when he again stole \$65 from his father and disappeared. He then served 3 months in the Navy, later 8 months in the Army, each time getting out on a medical discharge. In 1928 he was charged with attempted unlawful entry and given a suspended sentence. In the early part of 1930, he, together with Hyman, stole a Jewish typewriter, and on March 19, 1930, they were both committed to the New York City Reformatory at Hampton Farms. From there Joseph was paroled on September 30, 1930, but while on parole he cashed a check belonging to his employer and absconded with the money. He was therefore returned to Hampton Farms on December 19, 1930, and remained there until April 17, 1931. In the early part of 1932 he was arrested on a charge of attempted grand larceny (trying to pass a forged check); tried a plea of insanity, but without success, and on March 11, 1932, was committed to the State Institution for Male Defective Delinquents at Napanoch, N. Y. At the time of our observation of the case, which was in November, 1932, he was still an inmate there. A mental test in 1932 revealed I.Q. 74.—Hyman, too, was sent to the Jewish Protectory, as an ungovernable child, and was there from February 8, 1922, to November 5, 1923, and again from July 23, 1924, to February 23, 1927. There is no record of a mental test in his case, but he, too, is undoubtedly of subnormal intelligence with a poor record in studies and with behavior difficulties, such as running away from home and from the protectory, and later a very poor work record. As stated above, Hyman together with Joseph was committed to the New York City Reformatory at Hampton Farms, for stealing a typewriter, on March 19, 1930. From there he was paroled on November 25, 1930. At the time of our observation of the case (November, 1932) he was still at large, getting along fairly well, although changing jobs frequently.

Case 115. L. twins, William and John (alias Peter). Born in Yonkers, N. Y., November 24, 1905. Both parents died when the twins were still infants and the twins were reared in St. Joseph's Home at Peekskill, N. Y. Later their aunt took them. They did very poorly at school both in studies and behavior.—John was the first to become involved in serious delinquencies. His record begins with an arrest on July 21, 1920, for burglary, when he was placed on probation. From that time until the early part of 1931 he was arrested 11 more times for breaking and entering, robbery, intoxication, vagrancy, etc. He served a term at the State Reformatory at Elmira, N. Y., from March 12, 1926, to February, 1928, when he was transferred to the State Institution for Male Defective Delinquents at Napanoch. From there he was paroled on May 4, 1929, but on August 9, 1931, was returned for holding up a boy in charge of a store with a fake pistol and taking \$40 out of the cash register. At the time of our observation of the case, which was in November, 1932, he was still an inmate there. A mental test in March, 1931, revealed I.Q. 50.—William has a record of 5 arrests between 1922 and 1930 for unlawful entry, burglary, intoxication, and assault. He was given a suspended sentence; was later sent to the Westchester County (N. Y.) Penitentiary in 1923 for 1 year; to the House of Refuge, New York, in 1925, for an indeterminate sentence; finally was committed to Sing Sing Prison at Ossining, N. Y., in 1930, from where he was transferred to Great Meadow Prison at Comstock, N. Y. At the time of our observation of the case (November, 1932) he was still an inmate there. A mental test in 1932 revealed I.Q. 72.

Case 116. R. twins, Vincent and Charles Graciano. Born in Detroit, Mich., September 8, 1911. These boys were first brought before Juvenile Court in January, 1924, when only 12 years old, on a charge of grand larceny. Since

then they have been in various delinquencies both separately and together: petty thefts, running away from home, escaping from institutions, breaking 20 windows, violating parole, etc. They have been in Los Angeles Juvenile Hall; Pacific Lodge Boys' Home at Girard, Calif.; Los Angeles County Jail, Preston School of Industry at Ione, Calif. Charles has also been in the state school at Whittier, Calif., and in the Strickland Home for Boys in Los Angeles. At the time of our investigation of the case, which was in March, 1931, Charles had been on parole from the Preston School of Industry since September, 1930, and keeping out of trouble. Vincent had run away from home in March, 1930, got a job on a freight steamer and, when last heard from, was in Baltimore, Ohio. Mental tests made, respectively, in 1924 and 1926, revealed, for Vincent, I.Q. 70, for Charles Graciano, 81. Charles, the somewhat more intelligent twin, is said to have been the leader of the pair, yet Vincent, when alone, was also markedly delinquent.

Case 117. C. twins, Joseph and James. Born in San Francisco, March 22, 1912. These boys were first brought before Juvenile Court on November 2, 1927, together, for theft and for turning in false fire alarms. Since then they have been before the court repeatedly for stealing tires, a woman's coat, also for speeding on a motorcycle and violating probation. They were finally committed to the Preston School of Industry at Ione, Calif., November 22, 1929, and paroled January 19, 1931. At the time of our observation of the case, which was in March, 1931, they were at home and getting along very well. Mental tests in 1929 revealed, for Joseph, I.Q. 67, for James, 81.

Case 118. N. twins, John Joseph, Jr., and Michael Joseph. Born in Rankin, Pa., August 29, 1907. Father was a heavy drinker, abused wife and children; he was a mill worker, family was often destitute and parents would send the twins out to steal bread and milk from people's porches to have food for the family. Twins have 1 younger brother and 4 sisters, all free from delinquent tendencies. The twins were always together until they were sent to different penal institutions. They did poorly at school, reached sixth grade at the age of 16 years; played hookey together and sneaked into movie shows without paying.—Michael's institutional record on charges of larceny (mainly of automobiles), breaking and entering, and finally involuntary manslaughter (when in a drunken condition he stole an automobile and ran over and killed a four-year-old child) consists of imprisonment on 6 different occasions, beginning in 1922, for terms varying from 30 days to 11–22 years, in the Thorn Hill School at Warrendale, Pa., Pennsylvania Industrial Reformatory at Huntingdon, Allegheny County Workhouse at Blain, and Western State Penitentiary at Pittsburgh. At the time of our observation of the case, which was in July, 1932, he was still an inmate of the last named institution. Mental test in 1931 revealed I.Q. 59.—We do not have a full record of John's case, nor any results of mental tests. His school record was the same as Michael's and he, too, may be judged to be of subnormal intelligence. He served 2 terms of 1 year each for larceny, 1 in the Allegheny County Workhouse in 1928 and the other in the Pennsylvania Industrial Reformatory in 1929. The record is admittedly incomplete.

Group 16. Mental deficiency complicated with juvenile delinquency; females. Four cases, 119–122.

Case 119. J. twins, Agnes Emmaline and Madeline Jennie. Born in Austin, Minn., September 15, 1910. They were healthy, attractive babies, exactly alike, and won a prize in a baby show. At the age of 3 years they were separated, Madeline Jennie remaining with her mother in Pasadena, Calif., and Agnes

Jennie going to live with her foster parents in Rock Springs, Wyo. Madeline was brought up in somewhat straitened circumstances, while Agnes had many advantages in the home of her well-to-do foster parents. The twins corresponded occasionally, but were together only once since their separation, namely during a 4 weeks' visit at the age of 15 years. Their delinquent tendencies developed gradually shortly after puberty. These consisted, in both twins, of staying out nights, repeatedly running away from home, sexual relations with boys, lying, etc. After repeated appearances before the Juvenile Courts in their respective states and trials on probation, they finally both had to be committed, Madeline on November 2, 1928, to the Ventura School for Girls, Calif., and Agnes on June 18, 1929, to the Girls' Industrial Institute at Sheridan, Wyo. At the time of our investigation of the case, which was in March, 1931, Agnes was still in the institution, while Madeline was at home with her mother, having been released on parole May 11, 1930. Mental tests on their admission to the respective institutions, revealed, for Madeline, I.Q. 72, for Agnes, 89.

Case 120. N. twins, Doris and Dorothy. Born in Toronto, Canada, May 9, 1919. Both were delicate babies, have speech defect, faint frequently, are heavy sleepers. They both have very frequent urination; there is a problem of both nocturnal and diurnal enuresis and other symptoms suggesting diabetes insipidus. They have caused much concern at school on account of their sexual activities and promiscuity. They were referred to the Juvenile Court in Toronto, examination revealed ruptured hymen in both and gonorrheal infection in Dorothy. Dorothy seemed the leader and was committed to the Shirley School for Delinquent Girls in Toronto, on January 19, 1932, partly for the purpose of separating them. At the time of our investigation of the case, which was in August, 1932, she was still an inmate there, while Doris was on probation at home. Mental tests in 1932 revealed, for Dorothy, I.Q. 73, for Doris, 69.

Case 121. C. twins, Hazel Mae and Helen Louise. Born in Coshocton, Ohio, June 8, 1915. Home conditions were poor, parents separated, twins going back and forth between them. The twins left school at 16, having just reached the eighth grade. They were running around with a noisy and delinquent group of boys, but sexual relations were not proved. They were before Juvenile Court for breaking into their aunt's house and stealing various articles. Later they were brought in again for "incurability" and stealing a boat ride at night, although it was shown that Hazel alone was involved in the latter. On March 19, 1931, Helen was committed to the Girls' Industrial School at Delaware, Ohio. On July 1, 1931, Hazel, too, was committed there. At the time of our investigation of the case, which was in July, 1932, they were still inmates there. Reported by the institution authorities as "insufferably impudent and insolent; obstinate and defiant of all orders." Mental tests in 1931 revealed, for Hazel, I.Q. 69, for Helen, 68.

Case 122. K. twins, Mary and Louise. Born in Chicago, February 11, 1913. An older sister is insane. The twins did poorly at school, having reached but the third grade when they left school at 15. All their delinquencies consisted in sexual promiscuity; they served as prostitutes for a club of 20 boys, had incestuous relations with their brother, Louise had a chronic gonorrheal infection. They were committed to the Dixon State Hospital for epileptics and the feeble-minded, Louise on May 16, 1930, and Mary on May 11, 1931. At the time of our investigation of the case, which was in June, 1932, they were still inmates there, reported as being "constantly in trouble, fighting with other girls, using obscene language," etc. Mental tests in 1930 revealed, for Louise, I.Q. 42, for Mary, 43.

Group 17. Mental deficiency complicated with adult criminality; males. One case in Group 13—101—and 5 cases in Group 15—109, 110, 114, 115, and 118—present, as complications, not only child behavior difficulties or juvenile delinquency, but also adult criminality which eventually developed in them. We present, in this group, 4 additional cases, 123—126.

Case 123. K. twins, X. and Y. (The publication of their names or initials not authorized; they are Nos. 11760 and 11761, Connecticut State Prison at Withersfield.) Born in Bridgeport, Conn., May 4, 1907. Although they are said to have reached the eighth grade at school, they have but borderline intelligence. Mental tests in 1929 revealed, for Y., I.Q. 78, for X., 77. Both are tattooed from head to foot. The official police records of their delinquencies in Bridgeport, Milford, and Derby, Conn., admittedly incomplete and probably to some extent confused on account of their identical appearance, begin with an arrest of both together for burglary on September 18, 1925. Since then there is a record, for X., of 13 arrests for misdemeanors and felonies, such as reckless driving, false election registration, drunkenness and breach of the peace, theft, breaking and entering, etc. There is a similar record for Y. Most of these arrests were for offenses committed jointly, but, for each twin, there were 5 individual arrests. They have been given probation, fined, and given jail sentences of from 30 days to 6 months. On account of their youth they were for some years treated with leniency. Finally they were sentenced to the state prison on March 1, 1929. On November 10, 1930, they were granted parole, but on April 13, 1931, were returned for violation of same. At the time of our observation of the case, which was in August, 1932, they were still inmates there. Their behavior in prison has been unsatisfactory; they were being constantly reported for various infractions of regulations, such as having contraband in their possession, tattooing other prisoners, disorderly conduct, etc.

Case 124. J. twins, Opal and Nolan. Born in Holdenville, Okla., November 5, 1908. The twins went to school together, enlisted in the Army together, and were never separated for any considerable length of time until Opal was sent to prison.—In the Army Opal was rated as "inferior type, inadequate." On March 3, 1930, he was sentenced to U. S. Disciplinary Barracks at Alcatraz, Calif., for 5 years for "desertion, assault, and assault to commit rape." At the time of our investigation of the case, which was in March, 1931, he was still an inmate there. A mental test in 1931 revealed I.Q. 72.—Nolan was "not a good soldier," but never got into serious trouble, has no criminal record, was discharged from the Army at the termination of his enlistment period. No record of any mental test.

Case 125. L. twins, Leon and Lloyd. Born August 4, 1894. Family in fairly comfortable circumstances; twins have 3 brothers and 4 sisters, all free from delinquent tendencies. The twins did poorly at school, attained respectively, fourth and third grades at the age of 15 years.—Leon married at the age of 23 years, has 2 children. His first arrest was for abandonment of his wife and 2 young children; was given 2 years' probation; this was followed by divorce and he was ordered to pay alimony. His second arrest was for passing a forged check in 1928. He pleaded guilty and explained that he did it to get money to pay his alimony. Sentenced for a term of 1 to 2 years to Wisconsin State Prison on May 10, 1928; discharged on expiration of the sentence. At the prison he was well behaved, worked in carpenter shop. Mental test in 1928 revealed I.Q. 60.—Lloyd remained single; drafted into the Army for service in the World War, honorably discharged in 1919. His first and only arrest was in 1928 for passing a forged check; pleaded not guilty, demanded a jury trial, was convicted and sentenced to Milwaukee County House of Correction in

Wisconsin on May 8, 1928, for 1 to 2 years. There he was well adjusted, worked in chair factory, was discharged on expiration of his sentence. Mental test in 1929 revealed I.Q. 59.

Case 126. P. twins, Elmer and Delmar. Born in Illinois in 1906. Parents illiterate and very poor. The twins did poorly at school and were unable to progress beyond the third grade. There is no record of delinquency or criminality until September, 1925, when they were arrested together for stealing chickens and charged with grand larceny. They pleaded guilty and were committed to the Illinois State Reformatory, September 21, 1925. On November 9, 1926, they were paroled, and later returned to the reformatory a couple of times for small offenses, such as failure to send in reports to probation officers and throwing stones at an automobile and breaking the glass. At the time of our investigation of the case, which was in July, 1932, they were again out on parole and in good standing. Their behavior record while at the reformatory had also been very good. Mental tests in 1925 revealed, for Elmer, I.Q. 56, for Delmar, 55.

Group 18. Mental deficiency complicated with adult criminality; females. Two cases in Group 10—90 and 91—present, as complications, not only epilepsy, but also adult criminality. There are no additional cases among our female monozygotic twins.

Summary of Findings in Monozygotic Twins.

We have presented 126 pairs of monozygotic twins with mental deficiency in one or both of each pair: 65 pairs of male twins and 61 pairs of female twins.

The distribution of intelligence quotients among the 252 individuals is shown in Table II.

TABLE II
DISTRIBUTION OF INTELLIGENCE QUOTIENTS IN THE MONOZYGOTIC TWINS

	Males	Females	Total
I.Q. under 20.....	6	9	15
20-29.....	7	5	12
30-39.....	3	7	10
40-49.....	5	9	14
50-59.....	16	7	23
60-69.....	27	22	49
70-79.....	38	36	74
80-84.....	8	3	11
85 or over.....	4	5	9
Mentally deficient, I.Q. unascertained.....	13	18	31
Normal intelligence, I.Q. unascertained...	3	1	4
Total.....	130	122	252

The differences in I.Q. between the twins in the pairs vary as shown in Table III.

TABLE III
DIFFERENCES IN POINTS OF I.Q. BETWEEN TWINS IN MONOZYGOTIC PAIRS

	Points of difference in I.Q.						Total
	0-5	6-10	11-15	16-20	21-25	Over 25	
Number of ascertained cases	72	20	7	3	4	5	111
Per cent of ascertained cases	64.9	18.0	6.3	2.7	3.6	4.5	100

Our material may also be classified according to complicating conditions present, such as epilepsy, juvenile delinquency, etc., as in Table IV. Here the total figures exceed the number of individuals represented because some cases are counted more than once on account of presenting 2 or more complications.

TABLE IV
THE MATERIAL CLASSIFIED ACCORDING TO EXISTING COMPLICATIONS.
(MONOZYGOTIC TWINS)

	Males	Females	Totals
Uncomplicated mental deficiency.....	59	72	131
Mental deficiency with paralysis.....	2	8	10
“ “ “ epilepsy.....	6	15	21
“ “ “ psychotic disease.....	5	5	10
“ “ “ behavior difficulty.....	15	9	24
“ “ “ juvenile delinquency.....	32	9	41
“ “ “ adult criminality.....	18	3	21
Normal intelligence (I.Q. 85 or over) with complications	1	1	2
“ “ “ “ “ “ without “	6	5	11
Totals.....	144	127	271

There is a considerable contrast between cases of twins with uncomplicated mental deficiency and those presenting one or more of the enumerated complications in one or both of the pair, with respect to the degree of concordance in intelligence quotients. This is shown in Table V. In this table “both affected, similarly” means that both twins have an I.Q. under 85 and differ in intelligence to an extent not exceeding 5 points in I.Q.; “both affected, dissimilarly” means that both twins have an I.Q. under 85 and differ in intelligence to an extent of 6 or more points in I.Q.; and “one affected” means that one of the twins has an I.Q. under 80 and the other 85 or over.

The conditions complicating the mental deficiency are variously distributed in the twin-pairs. Most commonly they are

TABLE V

DEGREES OF CONCORDANCE IN I.Q. IN CASES WITH AND WITHOUT
COMPLICATIONS (MONOZYGOTIC TWINS)

	Uncomplicated Cases	Cases with Complications
Both affected, similarly	72.6%	47.6%
Both affected, dissimilarly	19.2%	38.1%
One affected	8.2%	14.3%

found to be similar in the 2 twins, *i.e.*, both have paralysis, epilepsy, or delinquency, etc. It happens, also, however, that any of the listed complications may be present in one twin of a pair, but not in the other. In some instances one of the twins presents one complication—say, epilepsy—and the other twin a different complication—say, psychotic disease. In Table VI the distribution of the complications in the twin-pairs, and their various combinations, are shown for our material. For the purposes of this table each twin appears at least twice—as “propositus” and as “other twin”; in a number of cases an individual appears in the table 3 or more times, depending on the number of complications existing in the given twin-pair.

TABLE VI

DISTRIBUTION OF THE COMPLICATIONS IN THE TWIN-PAIRS (MONOZYGOTIC TWINS)

	Propositi	The other twins							Totals
		Uncomplicated mental deficiency	Infantile Palsies	Epilepsy	Psychotic Disease	Behavior Difficulties	Juvenile Delinquency	Adult Criminality	
Uncomplicated Mental Deficiency....	145	134	1	2	2	—	—	—	145
Infantile Palsies	10	1	6	4	—	—	—	—	12
Epilepsy	21	2	4	16	1	1	1	1	28
Psychotic Disease	11	2	—	1	6	4	—	1	15
Behavior Difficulty	24	—	—	1	4	22	9	1	39
Juvenile Delinquency	42	—	—	1	—	9	41	11	62
Adult Criminality	20	—	—	1	1	1	11	17	33
Normal Individuals	11	6	1	2	1	2	—	2	14
Totals	284	145	12	28	15	39	62	33	348

Minor complications which are mentioned in the clinical histories of some of the cases presented, such as left-handedness, increased knee-jerks, stammering, strabismus, enuresis, etc., are not represented in the tables.

All the complicating conditions listed here are, of course, known to exist independently of mental deficiency. Yet, their occurrence as complications of mental deficiency, both in individuals and in monozygotic twin-pairs, is so frequent as to almost force the assumption of a fundamental relationship in etiology and pathology. This matter will be discussed further in a subsequent section.

§ 4. Dizygotic Same-Sex Twins.

Group 19. Uncomplicated mental deficiency; both affected, similarly; males. Four cases, 127-130.

Case 127. W. twins, Morris and Marshall. Born in Kremline, Mont., June 2, 1919. Observed by us in January, 1931, in one of the Long Beach, Calif., city schools. The twins are retarded at school, especially Marshall, who has been for some years in an opportunity room. Mental tests in 1930 revealed, for Morris, I.Q. 79, for Marshall, 75.

Case 128. P. twins, Armando and Alberto. Part-Indian. Born December 14, 1921. Observed by us in one of the Los Angeles city schools in April, 1932. Mental tests in 1931 revealed, for Armando, I.Q. 71, for Alberto, 70.

Case 129. T. twins, Roy and Raymond. Born in Auburn, Calif., February 8, 1918. Both parents are insane and are inmates in the Napa State Hospital, Calif. One sister of the twins is feebleminded and an inmate of Sonoma State Home, Calif. The twins were admitted together to the Sonoma State Home on April 13, 1920, and were still inmates there at the time of our investigation of the case, which was in February, 1931. Mental tests in May, 1929, revealed, for Roy, I.Q. 55, for Raymond, 52.

Case 130. L. twins, Anthony and Francis. Born in Boston July 1, 1924. Admitted to Wrentham State School in 1930, Anthony on July 16, Francis on October 31. At the time of our observation of the case, which was in July, 1932, they were still inmates there. Mental tests in 1930 revealed, for both, I.Q. 12.

Group 20. Uncomplicated mental deficiency; both affected, similarly; females. Nine cases, 131-139.

Case 131. V. twins, Mary and Dolores. Part-Indian. Born in Los Angeles April 11, 1916. Observed by us in one of the Los Angeles city schools in April, 1932. Mental tests in 1932 revealed, for Mary, I.Q. 77, for Dolores, 74.

Case 132. W. twins, Mabel and Mildred. Born in Dead River, Maine, June 27, 1907. Mabel was committed to the care of the State Board of Children's Guardians in April, 1921, and placed in the Pownal State School, Maine, on December 14, 1922. Mildred was committed to the custody of the State Department of Public Welfare in June, 1924, and she, too, was placed in the

Pownal State School, on February 12, 1926. At the time of our investigation of the case, which was in August, 1930, they were still inmates there. Mental tests were made repeatedly between 1923 and 1930 with somewhat varying results; the highest scores were, for Mabel, I.Q. 76, for Mildred, 71.

Case 133. S. twins, Ella and Ethel. Part-Indian. Born in Long Pine, Calif., March 6, 1916. Observed by us in December, 1931, in the Indian School at Arlington, Calif. Their school counselor stated that these girls seem "even more stupid than their I.Q. would indicate; other girls at the school with lower I.Q. do better work; they just sit and vegetate." Mental tests in 1931 revealed, for Ella, I.Q. 72, for Ethel, 67.

Case 134. S. twins, Eva and Beatrice. Born in San Francisco, December 14, 1914. Both were placed in an ungraded class in San Francisco city schools in 1928; at the time of our observation of the case which was in April, 1931, Eva was still in the ungraded class, while Beatrice had been transferred for vocational training to a part-time high school. Mental tests in 1928 revealed for Eva, I.Q. 72, for Beatrice, 67.

Case 135. G. twins, Sylvia and Goldie. Born April 21, 1916. Observed by us in one of the Los Angeles city schools in March, 1932. Mental tests in 1931 revealed, for Sylvia, I.Q. 70, for Goldie, 68.

Case 136. F. twins, Caroline and Elvira. Born in Rhode Island April 20, 1919. Observed by us in April, 1931, in the Gorman Avenue School for subnormal children in Los Angeles. Mental tests in 1930 revealed, for Caroline, I.Q. 69, for Elvira, 68.

Case 137. S. twins, Stella and Olga. Born in Yonkers, N. Y., September 10, 1918. Both were admitted to Letchworth Village, Thiells, N. Y., May 14, 1929. At the time of our investigation of the case, which was in January, 1931, they were still inmates there. Mental tests in 1930 revealed, for Stella, I.Q. 55, for Olga, 53.

Case 138. H. twins, Jessie and Josie. Born in Bellingham, Wash., July 7, 1908. Both were admitted to the Feeble-Minded Institute at Salem, Ore., March 4, 1922. At the time of our investigation of the case, which was in June, 1931, they were still inmates there. Mental tests in 1924 revealed, for Jessie, I.Q. 55, for Josie, 50.

Case 139. B. twins, Vioma and Lioma. Born in Imperial, Calif., in July, 1913. Parents are obviously subnormal and inadequate, maintain a filthy home, family is largely dependent on the San Diego County, Calif., Welfare Bureau. They have had 16 children, 10 of whom are living. An older sister of the twins, an idiot, died in the Sonoma State Home, Calif. At the time of our observation of the case, which was in November, 1931, the twins, though 18 years old, were in the fourth grade at school and doing very poorly; they still soil and wet themselves. No record of mental tests, but the twins are obviously imbeciles of about equal degree.

Group 21. Uncomplicated mental deficiency; both affected, but in a manner quantitatively dissimilar; males. Eight cases, 140-147.

Case 140. B. twins, Floyd and Lloyd. Born in Oklahoma, August 16, 1919. Both are 3 years retarded at school. Observed by us in November, 1931, in one of the Long Beach, Calif., city schools. Mental tests in 1931 revealed, for Floyd, I.Q. 79, for Lloyd, 70.

Case 141. L. twins, Leon and Leo. Born in Watertown, N. Y., December 23, 1913. Leon was admitted to Letchworth Village, Thiells, N. Y., June 6, 1923.

Leo was admitted to the same institution December 3, 1924. Both were transferred to the Rome State School, N. Y., April 18, 1929. At the time of our investigation of the case, which was in January, 1931, they were still inmates there. Mental tests in 1928 revealed, for Leon, I.Q. 76, for Leo, 66.

Case 142. V. twins, David and Albert. Born in Honolulu, Hawaiian Islands, August 21, 1921. Observed by us in March, 1932, in Oakland, Calif., city schools. David is 3 years retarded, Albert quite unteachable. Mental tests revealed, for David (in 1928), I.Q. 73; for Albert (in 1930), I.Q. 55.

Case 143. B. twins, Jim and Timothy. Born in San Francisco May 11, 1919. Observed by us in April, 1931, Jim in a parochial school and Timothy in an ungraded class in one of the public schools, San Francisco. Both have done poorly in studies, but especially Timothy. Mental tests revealed, for Jim (in 1931), I.Q. 70, for Timothy (in 1930), I.Q. 63.

Case 144. C. twins, Vernon and Irene (both are boys). Born in New Rochelle, N. Y., March 5, 1913. Vernon was admitted to Letchworth Village, Thiells, N. Y., November 12, 1929. Irene was admitted to the same institution May 26, 1930. At the time of our investigation of the case, which was in January, 1931, they were still inmates there. Mental tests in 1930 revealed, for Vernon, I.Q. 65, for Irene, 59.

Case 145. G. twins, Allen and Albert. Born in Reading, Pa., August 4, 1917. Admitted together to Pennhurst State School, Pa., February 22, 1926. At the time of our investigation of the case, which was in May, 1931, they were still inmates there. Mental tests in 1929 revealed, for Allen, I.Q. 50, for Albert, 22.

Case 146. G. twins, George and Robert. Born in Dedham, Mass., February 17, 1927. They were admitted together to Wrentham State School, Mass., June 26, 1929. Robert died there of acute enteritis on October 1, 1931. At the time of our observation of the case, which was in July, 1932, George was still an inmate there. Mental tests in 1930 revealed, for George, I.Q. 50, for Robert, 15. George was deaf-mute and his mental deficiency was, at least in part, of the sensory-deprivation type; he had been accepted by the state school for deaf-mutes and was about to be transferred there. Robert could hear and his mental deficiency was not in any measure to be accounted for by sensory deprivation.

Case 147. S. twins, Robert and Richard. Born in Pomona, Calif., April 5, 1922. Observed by us at Pacific Colony (state institution for feeble-minded and epileptics) at Spadra, Calif., in September, 1932. Mental tests in 1932 revealed, for Robert, I.Q. 41, for Richard, 25.

Group 22. Uncomplicated mental deficiency; both affected, but in a manner quantitatively dissimilar; females. Nine cases, 148-156.

Case 148. A. twins, Isabella Hope and Ellen Vere. Born in Mission, B. C., Canada, June 17, 1902. They were admitted together to the Provincial Mental Hospital at Essondale, B. C., March 25, 1920. At the time of our investigation of the case, which was in May, 1931, they were still inmates there. Isabella Hope has congenital heart disease and is quite cyanotic. Ella Vere is hard of hearing. Mental tests in 1925 revealed, for Isabella, I.Q. 79, for Ella, 45.

Case 149. W. twins, Dorothy and Dorline. Born in Kentucky, September 3, 1918. Observed by us in one of the Los Angeles city schools in April, 1932. Mental tests in 1932 revealed, for Dorothy, I.Q. 78, for Dorline, 72.

Case 150. G. twins, Fay and Fein. Born in Los Angeles, December 29, 1917. Observed by us in March, 1932, in one of the Los Angeles city schools. Mental tests in 1931 revealed, for Fay, I.Q. 78, for Fein, 70.

Case 151. B. twins, Patricia and Stella. Born in Seattle, Wash., March 17, 1929. The mother is feeble-minded and therefore unable to care for them. For this reason they were admitted as "potentially feeble-minded" to the State Custodial School, at Medical Lake, Wash., April 10, 1929. At the time of our investigation of the case, which was in May, 1931, neither twin had as yet learned to walk or talk; they were still inmates of the custodial school. Mental tests in July, 1930, revealed, for Patricia, I.Q. 75, for Stella, 50.

Case 152. DeM. twins, Mafalda and Yolanda. Born in California in May, 1919. Observed by us in April, 1932, in one of the Los Angeles city schools. Mental tests in 1931 revealed, for Mafalda, I.Q. 73, for Yolanda, 80.

Case 143. S. twins, Myra and Mildred. Born in Minnesota, January 3, 1921. Observed by us in March, 1932, in one of the Los Angeles city schools. Mental tests in 1932 revealed, for Myra, I.Q. 72, for Mildred, 84.

Case 154. McC. twins, Dorothy and Darlene. Born in Fullerton, Calif., October 16, 1923. Observed by us in one of the Fullerton city schools in October, 1931.—Dorothy is 2 years retarded, but neat, clean, orderly, of good disposition. Mental test revealed I.Q. 72.—Darlene attended school for 2 years, proved quite unteachable, finally had to be excluded, and arrangements are being made for her admission to Pacific Colony (state institution for feeble-minded) at Spadra, Calif. No record of a mental test in her case, but she is obviously a low grade imbecile: drools all the time, makes queer noises, cannot speak distinctly, still soils and wets herself.

Case 155. G. twins, Lila and Lucille. Born October 17, 1915. Observed by us in one of the Los Angeles city schools in March, 1932. Mental tests in 1930 revealed, for Lila, I.Q. 71, for Lucille, 83.

Case 156. S. twins, Catherine and Elizabeth. Born in United States April 9, 1909. Elizabeth was admitted to Letchworth Village, Thiells, N. Y., September 29, 1927. Catherine was admitted to the same institution May 15, 1930. At the time of our investigation of the case, which was in January, 1931, they were still inmates there. Mental tests revealed, for Catherine (in 1930), I.Q. 57, for Elizabeth (in 1927), I.Q. 25.

Group 23. Uncomplicated mental deficiency: 1 affected; males. Four cases, 157-160.

Case 157. S. twins, Raymond and Robert. Born May 24, 1921. Observed by us in April, 1932, in one of the Los Angeles city schools. Mental tests in 1931 revealed, for Raymond, I.Q. 77, for Robert, 92. Robert is large, well built, Raymond is small and wizened.

Case 158. R. twins, James and John. Born in London, Ohio, July 6, 1913. James has always done poorly at school, has been in special private schools for subnormal children, finally was placed in the Institution for Feeble-minded at Orient, Ohio, Aug. 20, 1929. At the time of our investigation of the case, which was in August, 1932, he was still an inmate at the institution at Orient. Mental test in 1929 revealed I.Q. 61.—John has always been of normal or superior intelligence, was in college at the time of our investigation.

Case 159. F. twins, Martin and Harold. Born in San Francisco, July 26, 1919. Martin has been handicapped from birth; weighed only 1½ lbs., was cyanotic, had to be fed with a medicine dropper, had great difficulty in retaining

food. Did not walk or begin to talk until he was $5\frac{1}{2}$ years old. Had partial congenital blindness. He was admitted to Sonoma State Home, California, October 31, 1925; paroled July 11, 1929. At the time of our investigation of the case, which was in February, 1931, he was at home and going to school (first grade). Mental test in 1924 revealed I.Q. 44.—In Harold's case there is no record of any mental test, but he is obviously normal: goes to school, is in the sixth grade (1931), plays the violin; has always been much larger than his twin-brother.

Case 160. H. twins, Samuel and Joseph. Born in New York January 22, 1926. Samuel has been abnormal from birth, cried continually for 3 months, misshapen dolichocephalic head, flaring ears, high narrow palate. He was placed in the Children's Hospital and School at Randall's Island, N. Y., November 5, 1928, and discharged to the custody of his father January 13, 1929. At the institution he was found to have increased deep reflexes, was in constant rocking motion, an habitual head roller when in bed, made grotesque grimaces, restless, screamed a great deal, no sphincter control, often would strike other children near him, could not stand without support, did not talk. Mental test in 1928 revealed, I.Q. 42.—There is no record of a mental test for Joseph, but at the time of our investigation of the case, which was in July, 1931, he was obviously a normal child, but somewhat mischievous and inclined to tease and make fun of his twin-brother.

Group 24. Uncomplicated mental deficiency; one affected; females. Eleven cases, 161-171.

Case 161. C. twins, Mabel and Opal. Born in Colorado Springs, Colo., August 10, 1917. Case referred to us by Institute of Child Welfare, University of California, at Berkeley, Calif., in April, 1931. Mabel is 2 years retarded at school and is in "slowest moving section." Mental test in 1930 revealed I.Q. 78.—Opal has done better at school; mental test in 1929 revealed I.Q. 101.

Case 162. W. twins, J. and M. Born in Green Bay, Wis., March 21, 1921. Observed by us in the Santa Monica, Calif., city schools in March, 1931. J. has done poorly at school, has been in "slow moving group," repeated the third grade, failed in all subjects, and is about to be placed in an "adjustment room." Mental test in 1931 revealed, I.Q. 76.—M. has always done below-average work, but apparently mainly on account of a "generally antagonistic attitude." A mental test in 1931 revealed I.Q. 109.

Case 163. P. twins, Caroline and Elnora. Born in Yorba Linda, Calif., October 2, 1912. Both twins are musical, but Caroline is especially gifted. Caroline, however, had done poorly in school, except in music. Now they provide many musical programs in Fullerton, Calif., and neighboring towns. Mental tests in 1927 revealed, for Caroline, I.Q. 72, for Elnora, 102.

Case 164. A. twins, Mary Jane and Mary Louise. Born in Placentia, Calif., July 14, 1910. Both girls dropped out of high school at the end of the first year, having failed in most subjects. Family is often on charity. Mary Louise, however, has worked as waitress since leaving school, whereas Mary Jane is at home, idle (November, 1931). Mental tests in 1927 revealed, for Mary Jane, I.Q. 71, for Mary Louise, 106.

Case 165. M. twins, Betty and Catherine. Born in Bellflower, Calif., May 14, 1925. Observed by us in one of the Bellflower public schools in January, 1932. Poor home background. Betty does not seem to understand anything that goes on at school; sits with mouth open, gazes vacantly around, yells out occasionally, does not seem to grasp the simplest directions, is in filthy

bodily condition.—Catherine is always busy and happy, shows a motherly protective attitude toward Betty, is quite a leader. Mental tests in 1931 revealed, for Betty, I.Q. 65, for Catherine, 110.

Case 166. R. twins, Ruby and Opal. Born in Los Angeles, March 25, 1893. Observed by us in December, 1930. Ruby has always been physically frail, weighed only 29 lbs. at 5 years. Did very poorly at school and got only as far as the fifth grade. She married in 1918, but the husband got tired of her because she was below-par mentally, and they were divorced in 1928. After the divorce she became promiscuous sexually and was committed to Pacific Colony (state institution for feeble-minded) at Spadra, Calif., September 19, 1929. In November, 1930, a job was obtained for her as maid at \$15 per month with board and room and she was paroled. A mental test in 1930 revealed I.Q. 61.—There is no record of any mental test in Opal's case, but she is obviously of normal intelligence. She did well at school, then took up music in a girls' collegiate school, later married, now has several children, and is a capable mother and an efficient housewife.

Case 167. K. twins, Lillian and Emma. Born in Sacramento, Calif., April 10, 1907. Lillian did poorly at school, left at 16 years when she had reached but the seventh grade. After that she worked some, but eventually had an illegitimate child, and, on September 24, 1929, was committed to Sonoma State Home, California. On December 1, 1929, she was released on parole and was still on parole at the time of our investigation of the case, which was in February, 1931. A mental test in 1929 revealed I.Q. 60.—Emma has always been bright, graduated from high school, is at home, keeping house for her sister; no record of mental tests.

Case 168. B. twins, Clara and Bessie. Born in New York October 23, 1915. At the time of our investigation of the case, which was in March, 1931, they were in the New York city schools, Clara in an ungraded class, Bessie in the first year of high school. Clara was the first-born of the twins; has always done poorly at school; is also handicapped temperamentally, being disagreeable, quarrelsome, demanding at home, incoöperative. Mental test in 1926 revealed I.Q. 53.—There is no record of any mental test in Bessie's case, but she is obviously normal both intellectually and temperamentally.

Case 169. G. twins, Emma and Madeline. Born in Engleburg, Colo., April 8, 1905. Emma never learned to read or write, proved unteachable at school; never earned wages; described as very stubborn and antagonistic toward her twin-sister. On October 20, 1929, she was committed to Sonoma State Home, California, because she was "running around, causing trouble in the neighborhood, not able to take care of herself," etc. At the time of our investigation of the case, which was in March, 1931, she was still an inmate there. Mental test in 1929 revealed I.Q. 43.—Madeline is normal in intelligence (no record of mental test), married, but is said to be given to temper tantrums.

Case 170. M. twins, Elsie Deborah May and Margaret. Born in Washington, D. C., date not given. The twins were young adults, over 21 years of age at the time of our investigation of the case, which was in August, 1931. The parents are prominent citizens, have a fine home; the twins have received the best of care. Labor was prolonged and difficult, but not instrumental. The twins presented a marked contrast from the beginning. Elsie May weighed 5½ lbs.; Margaret, 7½ lbs. Margaret has since been normal in every way. Elsie May did not respond to stimuli in infancy, did not seem to recognize her parents until the age of 2½ years, did not sit up alone until 3 years, did not walk until 4 years; proved unteachable at school, cannot read or write. She was placed in the State School for Mental Defectives at Winfield, Kan., on January 21,

1925, and was still an inmate there at the time of our investigation of the case in 1931. A mental test in 1925 revealed I.Q. 26.

Case 171. A. twins, Bertha and Emily. Born in England in 1895. At the time of our investigation of the case, which was in September, 1931, Emily was normal, working as clerk in a glove store, supporting herself. She had also been supporting her twin-sister up to the time of the latter's death from influenza in 1926. Bertha's mental deficiency is attributed to a head injury sustained in early infancy when she fell off a table. She was described to us as a typical imbecile with tendency to drool, unteachable, unable to do chores at home except under close supervision; no mental tests, but her mentality was estimated as corresponding to that of a child of 3 or 4 years. Estimated I.Q. 22.

Group 25. Mental deficiency complicated with infantile palsies; males. Two cases, 172-173.

Case 172. M. twins, Frank and Joseph. Born in Brooklyn, N. Y., May 18, 1912. Birth was difficult, instrumental, in Frank's case by breech presentation. Joseph has gone through school and has worked normally; no record of mental tests, but he seems of average intelligence.—Frank has been weak from birth, could not sit up until 2 years, started to walk at 4 years. He was placed in the Children's Hospital and School, Randall's Island, N. Y., on May 16, 1924, and discharged as unimproved to the custody of his mother on November 17, 1924. Our investigation of the case was in July, 1931. He has a spastic paralysis with markedly exaggerated knee-jerks, more pronounced on right side; he is also left-handed, and has double internal strabismus; speaks indistinctly. He also presents behavior difficulty at home: has temper tantrums, fights with brothers and sisters, stamps his feet, screams, throws things. A mental test in May, 1923, revealed I.Q. 56.

Case 173. C. twins, Myron and Jerome. Born in New York October 3, 1920. There has never been anything abnormal about Jerome. At the time of our observation of the case, which was in July, 1931, he had been making good progress at school and was in good health mentally and physically.—Myron's trouble seems to have begun at the age of 5 months when he had a fever with convulsions followed by a right hemiplegia. Since then he has developed poorly, has been unable to go to school, and on February 7, 1929, was placed in the Children's Hospital and School, Randall's Island, N. Y. On September 16, 1929, he was discharged as unimproved, to the custody of his parents. He has a bulging forehead, residuals of an old right hemiplegia, concomitant squint, slightly spastic gait. He is also restless, talks a great deal, cries readily. A mental test in 1929 revealed I.Q. 30.

Group 26. Mental deficiency complicated with infantile palsies; females. Three cases, 174-176.

Case 174. M. twins, Gertrude and Agnes. Born in Framingham, Mass., December 5, 1888.—The mother is a patient in the Westborough State Hospital, Mass., with involutional melancholia.—There are no records of mental tests of either twin, but both are obviously of subnormal intelligence, Agnes more markedly so.—Gertrude works in the kitchen of a cheap hotel, "never went to school much," is dull, has little to say, judged to be a moron. She is, however, free from paralysis and epilepsy.—Agnes is said to have developed normally up to the age of 18 months, when she had some acute neurologic condition which left her with a right hemiplegia. At the age of 6½ years she began to have epileptic convulsions, grand mal in type, which have continued since then, and at the time of our observation of the case, which was in August, 1932, she

was having 5 to 10 seizures per month. She has had but 2 or 3 years of schooling and can read and write. She was admitted to the Monson State Hospital, Mass., on July 2, 1922, and was still an inmate there at the time of our observation of the case (1932). The brain lesion seems to be in the region of the pons as she had a crossed paralysis involving left side of face and right side of body with contractures affecting hand and foot.

Case 175. S. twins, Beverly and Barbara Marion. Born in San Diego, Calif., February 8, 1921.—Beverly was the first-born of the twins. She had 2 convulsions within 3 weeks after her birth. She has never walked, crawls on hands and knees on account of spastic paralysis affecting mainly right arm and left leg. Did not begin to talk until 3 years. Cannot dress herself. Soils and wets herself. She was placed in Sonoma State Home, Calif., on July 25, 1926, and was still an inmate there at the time of our observation of the case, which was in March, 1931. A mental test in 1926 revealed I.Q. 47.—Barbara Marion has never had convulsions, is free from paralysis, goes to school, also takes piano lessons. A mental test in 1931 revealed I.Q. 116.

Case 176. D. twins, Lena and Opal. Born in Neodesha, Kan., April 27, 1907.—The family is in good standing in the community, all normal and prosperous.—There has been difficulty with Lena from the beginning. She weighed only 2½ lbs. at birth. At 4 months she had an acute ailment with convulsions followed by spastic paralysis affecting mainly her legs. The convulsions continued until the age of 12 years, when they ceased spontaneously. Her mental development has been very slow. There is no record of a mental test, but she is obviously a low grade imbecile. She did not sit up alone until 6 years, nor stand alone until 7; she walked at 8 years; used spoon at 10 years. She was admitted to the State School for Mental Defectives at Winfield, Kan., on September 15, 1925, and at the time of our observation of the case, which was in August, 1931, she was still an inmate there.—Opal is normal both mentally and physically, is a school teacher.

Group 27. Mental deficiency complicated with epilepsy; males. Five cases, 177-181. (Case 173 in Group 25 also presents convulsions as a complication.)

Case 177. N. twins, Thomas Henry and James Edward. Born in Los Angeles, Calif., December 21, 1922. Our observation in February, 1935.—James was the first-born of the twins, head presentation, normal delivery, weight 5½ lbs. He has always been of normal intelligence and behavior, in good health physically, no epileptic manifestations. Mental test in 1935 revealed I.Q. 131.—Thomas was the second-born, breech presentation, weighed less than 3 lbs.; it was thought he would not live and a priest was called. He is said to have been "born crippled," but at the time of our observation there were no evidences of any infantile palsy. He had strabismus and cataract of left eye which were partly relieved by 2 operations in early childhood. At 2 years, 9 months, he had another convulsion and thereafter continued to have them until the age of 7 years almost daily and sometimes several in one day. Then the convulsions ceased, but began again at 12 years, and he has been having them since at the rate of about 2 a month. At 8 years both twins had scarlet fever, but Thomas alone developed ear complications and is now totally deaf in the left ear and hard of hearing in the right. He has done very poorly in his studies at school, is in 5B now, but is failing (James is in 7B and doing very well). Mental test in 1935 revealed I.Q. 66.

Case 178. B. twins, Charles and Robert. Born in Philadelphia, Pa., May 20, 1923. The twins are the youngest of 10 children; all the others are reported to be normal.—Charles was greatly retarded in learning to walk and talk; still

lisps; has enuresis day and night. Was admitted, together with Robert, to Children's Hospital and School, Randall's Island, N. Y., February 28, 1927. He was transferred to Letchworth Village, Thiells, N. Y., May 26, 1931. Robert was also transferred to Letchworth Village, May 12, 1931. At the time of our observation of the case, which was in July, 1931, they were both inmates there. Charles has been free from convulsions or behavior difficulty. A mental test in 1931 revealed I.Q. 62.—Robert's mental deficiency is more pronounced. A mental test in 1927 revealed I.Q. 32. He has also had epilepsy since the age of 4 months. Has concomitant strabismus. Soils and wets himself. He presents marked behavior difficulty: restless, overactive, destructive, screams, strikes other children, runs away from the ward, at times requires restraint.

Case 179. C. twins, Edward and Frank. Born in San Francisco May 22, 1919.—Edward has had *petit-mal* attacks almost from birth; at 4 years he began to have *grand-mal* attacks averaging 2 a day; under medication the frequency has been reduced. He was placed in Sonoma State Home, Calif., in November, 1923. At the time of our observation of the case, which was in February, 1931, he was still an inmate there. Mental test in 1924 revealed I.Q. 29.—Frank has developed normally, goes to school and makes good progress, has never had a seizure.

Case 180. P. twins, Raymond and Ramon. Born in Durant, Okla., January 9, 1922.—Mother's sister had 2 imbecile children who died young.—The twins were admitted together to the State Home for Mental Defectives at Enid, Okla., on February 16, 1931. At the time of our observation of the case, which was in August, 1931, they were still inmates there. There are no records of mental tests, but they are obviously defective, Raymond in the degree of imbecility, Ramon in the degree of idiocy. Raymond talks a little, Ramon not at all. Raymond has epilepsy; Ramon is free from epilepsy, but develops choreiform movements under excitement.

Case 181. J. twins, Louis and Lawrence. Born in Los Angeles September 2, 1925.—Mother is feeble-minded and alcoholic; an older brother of the twins is an inmate of Pacific Colony, feeble-minded; 2 older sisters are subnormal in intelligence with I.Q.'s, respectively, 74 and 82.—Our observation of the twins was in September, 1932, in a boarding home where they were placed pending arrangements for their admission to Pacific Colony (state institution for the feeble-minded) at Spadra, Calif. No record of mental tests, but they are obviously mentally defective in the degree of idiocy or low grade imbecility. Louis has been subject to epileptic seizures, but Lawrence has been free from them.

Group 28. Mental deficiency complicated with epilepsy; females. Three cases in Group 26, 174-176, present, as complications, not only infantile palsies, but also epilepsy. In addition, we present here 11 other cases complicated with epilepsy, 182-192.

Case 182. G. twins, Phyllis and Violet. Part-Negro. Born in Kensington, Jamaica, July 3, 1915. Observed by us in the Public Health Clinic, Toronto, Canada, in August, 1932. Both have subnormal intelligence. Mental tests in 1932 revealed, for Phyllis, I.Q. 73, for Violet, 71. Phyllis suffers from headaches, has night terrors, and has had convulsions since birth, occurring about once a month. Violet is free from any manifestations of epilepsy.

Case 183. H. twins, Eva and Elsie. Born in Toronto, Canada, July 26, 1913. Mother is said to be immoral, unpopular in the neighborhood, and is alleged to have encouraged the twins in their misconduct. Both twins are of subnormal intelligence. Mental tests in 1926 revealed, for Eva, I.Q. 72, for Elsie, 64.

Both are also juvenile delinquents.—Eva was sent to the House of Industry, Toronto, on June 6, 1926, "for incorrigibility." She remained there until January 14, 1928. Soon after her release she became pregnant and in 1929 gave birth to an illegitimate child. On January 14, 1931, she was committed to the Edith Groves School for Delinquents in Toronto and at the time of our investigation of the case, which was in August, 1932, she was still an inmate there. Her case is also complicated with epilepsy; convulsions began at the age of 1 year and have occurred since at the rate of about one a month.—Elsie also has been promiscuous sexually, gave birth to an illegitimate child in February, 1930, and on May 4, 1930, was committed to the Ontario Hospital at Orillia, Canada. At the time of our observation of the case she was still an inmate there. She has never had any manifestations of epilepsy.

Case 184. P. twins (maiden name), Annie and Carrie. Born in Texas in 1914.—Annie was the first-born of the twins, is left-handed, did poorly at school, reached the fifth grade at 15 years. Had typhoid fever at 13 years. There is no record of a mental test, but she is obviously of subnormal intelligence, probably in the degree of moronism, high grade.—Both twins married very young and both had the first child at 15 years. Annie developed eclampsia in childbirth, had about 25 convulsions, and has had epileptic seizures ever since, at the rate of about one a month. On March 3, 1932, she was admitted to the Abilene State Hospital, Texas, on account of the epilepsy. At the time of our observation of the case, which was in June, 1932, she was still an inmate there.—Carrie has never had convulsions and is in good health mentally and physically.

Case 185. F. twins, Loretta and Katherine. Born in San Francisco October 15, 1911.—Loretta did poorly at school in marked contrast with her twin-sister; left school at 13 years, when she had reached the fifth grade. At 6 years she began to have *petit-mal* attacks very often—up to 30 in a single day. At 11 years she began to have *grand-mal* seizures at intervals of 7 to 10 days. Later, under treatment, the attacks became less frequent—about once in 2 months. In her early 'teens, she developed also mild psychotic symptoms: irritability, spells of severe depression with suicidal tendency. Finally she made a suicidal attempt, and on September 29, 1928, was committed to the Sonoma State Home, Calif. At the time of our observation of the case, which was in February, 1931, she was still an inmate there. A mental test in 1928 revealed I.Q. 60.—Katherine did well in studies, graduated from high school at 18 years, has a clerical position; has never had any epileptic manifestations, and is normal mentally and physically.

Case 186. C. and A. twins (married names), Esther and Ruth. Born in Illinois June 21, 1906.—Esther developed epilepsy at the age of 14 years when her menstruation started. Seizures occurred at the rate of 4 or 5 a month. In spite of this, she married and had a baby in March, 1929. Following the birth of her child the seizures grew worse, and on September 30, 1929, she was committed to the state hospital for feeble-minded and epileptics at Dixon, Ill. At the time of our observation of the case, which was in June, 1932, she was still an inmate there. A mental test in 1929 revealed I.Q. 58, but it is a question to what extent this is attributable to original mental deficiency and to what extent to epileptic deterioration. She was found, on admission to the hospital, to have also a valvular heart lesion.—Ruth has been free from epileptic manifestations, is married, keeps house, is well adjusted, and is in good health, physically and mentally.

Case 187. R. twins, Nita and Nina. Born in Rupert, Idaho, Aug. 3, 1916.—Nita weighed only 5 lbs. at birth and has always been smaller than her twin-sister, now weighs 20 lbs. less. She was retarded as to dentition and walking;

has speech defect; menstruation set in at 12 years, has been irregular, and she often goes 3 or 4 months without a menstrual period. Her intellectual development has also been retarded; she had to be taken out of school at 9 years, has been taught privately since then, but has never been able to do fifth grade work. At the age of 2½ years she developed epilepsy, seizures occurring at the rate of one or two a month. At the age of 15 years the seizures increased in frequency to 2 to 4 a week. She has also suffered a great deal from fainting attacks and sick headaches. On May 25, 1932, she was admitted to the Santa Barbara (Calif.) County Hospital, and at the time of our observation of the case, which was in June, 1932, she was still a patient there. No record of a mental test, but she is obviously feeble-minded with an estimated I.Q. of between 50 and 60.—Nina had a fainting attack at the age of 2 years; occasionally, when very tired, has a sick headache. Otherwise she has been in good health physically and mentally; is a sophomore in high school, helps with the house work at home, cheerful in disposition, well adjusted. A mental test in 1932 revealed I.Q. 90.

Case 188. McL. twins, Ivy and Violet. Born in Brock, Ont., Canada, February 11, 1916.—The twins have a good home and are given every care by their parents. Both were sickly and delicate in infancy. Observed by us in the Public Health Clinic at Toronto in August, 1932. Ivy is stolid, has speech defect, untidy, has enuresis, but has not had epilepsy. Violet began to have convulsions at 1 year which continued thereafter until the latter part of 1931, when she was placed under treatment at the Clinic. At the time of our observation of the case, which was in 1932, she had been free from seizures for nearly a year. Both twins are feeble-minded. Mental tests in 1925 revealed, for Ivy, I.Q. 53, for Violet, 41.

Case 189. C. twins, Elizabeth and Marjorie. Born in Cambridge, Mass., December 4, 1908.—Elizabeth was the first-born. She was slow in learning to walk and talk—about 6 months behind Marjorie. At 18 months she had measles and with it her first convulsion. Thereafter convulsions occurred at intervals of about 3 months up to the age of 5 years, when they became lighter, but more frequent—about once a week. At the age of 11 years the seizures became more violent again with a tendency to occur in series: on one occasion had 11 seizures in one day. She was admitted to the Monson State Hospital, Mass. (for epileptics) on May 15, 1931. At the time of our observation of the case, which was in August, 1932, she was still an inmate there. At the hospital under treatment the frequency of seizures has been reduced from 5 or 7 a month to 1 or 2. A mental test in 1931 revealed I.Q. 45.—Marjorie is of normal intelligence, went to business college, then did clerical work in a newspaper office. Later she married and now has 2 children. Has always been well adjusted and in good health mentally and physically. Has never had any manifestations of epilepsy.

Case 190. P. twins, Beatrice and Lena. Born in Woodstock, Ont., Canada, March 3, 1909.—Both parents said to have been intemperate and sexually promiscuous.—Early history of the twins is not known. At the age of 4 years they were placed in a children's home, and at the age of 9 years, namely on June 4, 1918, they were placed in the Ontario Hospital at Orillia, on account of feeble-mindedness in both, and epilepsy in Beatrice. No record of mental tests, but the twins have been unteachable and judged to be imbeciles. Lena died at the hospital in Orillia on September 4, 1921, of a chronic intestinal condition. She had never had epilepsy.—Beatrice had frequent and severe seizures at the hospital; on one occasion in 1931 was in *status epilepticus*; in one six-month period, also in 1931, had 171 seizures. On December 15, 1931, she was trans-

ferred to the Ontario Hospital at Woodstock. At the time of our investigation of the case, which was in August, 1932, she was still an inmate there. In the past year, under heavy medication with phenobarbital, the seizures have been greatly reduced both in frequency and severity.

Case 191. L. twins, Bertha and Edith. Born in New York City October 24, 1896. There are no records of mental tests, but both twins are obviously feeble-minded and have never been able to go to school. Both are also psychotic; they are quarrelsome, noisy, fight constantly; finally they could no longer be cared for at home and both were committed as insane, Edith to the Central Islip State Hospital, N. Y., on February 11, 1930, and Bertha to the Kings Park State Hospital, N. Y., on March 21, 1930. At the time of our observation of the case, which was in August, 1932, they were still inmates of the respective institutions.—In addition to the mental deficiency and psychotic trouble, Bertha has epilepsy, which began at the age of 5 years and has grown progressively worse until she was having 20 or more seizures a month. Under treatment at the hospital the seizures have been greatly reduced in frequency, but not suspended.—Edith has never had seizures, except possibly in the neo-natal period when she is said to have had "spinal meningitis." The diagnoses at the hospitals were, for Bertha, "epilepsy with psychosis," and, for Edith, "mental deficiency with psychosis."

Case 192. S. twins, Rhoda and Verna. Born in Pittsburgh, Pa., June 2, 1926. Our observation in our city office at Los Angeles in March, 1932.—Verna's development has been normal, and a mental test in 1932 revealed I.Q. 109.—In Rhoda's case trouble began on the day following her birth. She developed marked jaundice; next day it was noticed that her fontanelles bulged; on the fourth day she had several convulsions, was stuporous, and thought to be dying. On the fifth day spinal puncture released bloody fluid. She was fed with a nasal tube, but on the fifteenth day was well enough to take the breast. For 6 months there was rigidity of the neck with more or less retraction; this eventually disappeared. Did not begin to walk until 2 years; has never learned to speak beyond saying a few single words. Has to be dressed, undressed, helped at toilet, fed, etc. Neurologic examination negative at the time of our observation. Patient had a violent tantrum when a mental test was attempted. Estimated I.Q. 17.

Group 29. Mental deficiency complicated with psychotic disease; males. Two cases, 193-194.

Case 193. G. twins, Karle and Keith. Born in Mapleton, Iowa, May 29, 1904. Karle was very backward at school and later maladjusted vocationally, working irregularly as mess-boy or at odd jobs. This was in marked contrast with Keith, who graduated from high school and later took a commercial course at the University. Keith has been successful as a real estate broker.—There is no record of a mental test in Karle's case, but it is judged that his intelligence is not above the borderline level. From the age of 9 years he has had "gloomy spells," occurring every few weeks, when he would lock himself in his room and creep out for meals when everybody was gone. He had a strong suicidal tendency, finally made 2 suicidal attempts, and, on September 19, 1925, was committed, as insane, to the Patton State Hospital, Calif. At the time of our investigation of the case, which was in November, 1930, he was still an inmate there. The psychosis seems to have been of a deteriorating type. The hospital diagnosis is "mental deficiency with psychosis."

Case 194. C. twins, Valentine and Alonzo. Born in Forest Grove, Wis., July 2, 1858. The father of the twins is said to have been insane.—Alonzo has been well mentally and physically.—In Valentine's case there is a history of a head injury caused by a kick from a horse at the age of 3 years, and the relatives attribute his mental trouble to that injury. He has always been of subnormal intelligence, "on the level of a four-year-old child." In addition to his intellectual handicap he has also been abnormal temperamentally: careless in personal habits, erratic, quarrelsome, irritable, difficult to manage. The difficulties became more and more accentuated as he grew old; by that time there was no longer anyone interested in taking care of him, and on July 27, 1929, he was committed, as insane, to the Western Oregon State Hospital, at Salem. At the time of our investigation of the case, which was in January, 1931, he was still an inmate there. The hospital diagnosis was "mental deficiency with psychosis."

Group 30. Mental deficiency complicated with psychotic disease; females. Two cases in Group 28, 185 and 191, present, as complications, not only epilepsy, but also psychotic trouble. We present here 4 additional cases complicated with psychotic disease, 195-198.

Case 195. G. twins, Thelma and Selma. Born in Chicago Heights, Ill., March 10, 1915. Observed by us in September, 1931, in one of the Long Beach, Calif., city schools. Mental tests in 1929 revealed, for Thelma, I.Q., 76, for Selma, 97. The twins are quite inseparable and were both in the ninth grade at the age of 16 years, Thelma, however, getting poor grades, Selma getting A's and B's. Both are extremely schizoid; they are shy, unsociable, and all attempts on the part of teachers to get them to mix with other pupils have been to no avail. They seek to avoid the companionship of others, will not play, usually walk together hand in hand, and, according to the school nurse, their attachment for each other is "beyond wholesome limits."

Case 196. B. and F. twins (married names), Ruth and Evelyn. Born in Aberdeen, S. D., September 6, 1894. Ruth was the first-born, mother was in labor 4 days; Evelyn's birth followed and was much easier.—Ruth has presented a behavior problem ever since she was 4 years old; she would have frequent fits of temper with screaming and throwing things. She did poorly at school. Later there was maladjustment in domestic life. She married her first husband at 21 years, but would leave him every few months without apparent cause and he finally divorced her. Later she re-married, but has treated her second husband in the same way. They have one child who is mentally deficient and an inmate of the State Custodial School at Medical Lake, Wash. Ruth's temper outbursts became dangerous, and on February 21, 1931, she was committed, as insane, to the Western State Hospital at Fort Steilacoom, Wash. At the time of our observation of the case, which was in May, 1931, she was still an inmate there. In the insanity complaint the husband stated that she had become unmanageable, screamed at night, was violent at times, once threw a kettle of scalding water over him. At the hospital she quieted down, helped around the ward, caused no trouble of any kind. A mental test in 1931 revealed I.Q. 75.—Evelyn did well at school, later became a teacher, then married. She has been well adjusted and in good health physically and mentally.

Case 197. A. twins, Elizabeth and Josephine. Born in Berkeley, Calif., February 9, 1888. Josephine has harelip and cleft palate; Elizabeth has no such anomaly. Both did poorly at school, Elizabeth was slightly the brighter.

They left school at 15 years, when Elizabeth had reached the sixth grade and Josephine the fifth. There are no records of any mental tests prior to their psychosis, but they are both obviously defective. It is estimated from data in the case histories that Elizabeth's original endowment corresponded to an I.Q. between 70 and 80; Josephine's between 60 and 70. Mental tests in 1924, which was about 6 years after the onset of their psychotic trouble, revealed, for Elizabeth, I.Q. 50, for Josephine, 22; but these results are undoubtedly attributable in large measure to psychotic deterioration. After leaving school they both worked part of the time in a laundry and part of the time at home helping their mother up to the onset of their psychotic trouble, which was, for both, at the age of 30 years, Josephine's breakdown preceding Elizabeth's by a few weeks. Prior to their psychotic disease both girls were good natured, easy going, getting along well with other girls working in the same place.—In the early part of 1918, without stated cause, Josephine became noisy, restless, would run out on the street and scream, agitated at night, careless in dress, refused to associate with anyone outside of the family; she turned against her twin-sister, would fight and scratch her. They tried for several years to take care of her at home, but finally she attempted suicide by turning on the gas.—When Josephine broke down Elizabeth was taken from her job in the laundry and kept at home to help take care of Josephine. This enraged her very much; she became profane and violent at times, especially toward her twin-sister, and soon developed auditory hallucinations. Her psychosis gradually grew worse, she became destructive around the house, once flew into a rage and pulled out her hair, then would not talk for weeks.—Finally they were both committed to the Agnew State Hospital, Calif., on January 12, 1924. At the time of our observation of the case, which was in March, 1931, they were still inmates there.—At the hospital they quieted down eventually, presenting the characteristic picture of advanced psychotic deterioration: stayed mostly by themselves, took no interest in anything or anybody, were seen smiling to themselves, very untidy and requiring constant attention to keep them clean.

Case 198. G. and B. twins (married names), Lena and Martha. Born in Chicago August 8, 1879. Lena has always been of subnormal intelligence; she was very backward at school and was unable to reach beyond the fourth grade. Original intelligence estimated as corresponding to I.Q. 60. After school, she served as domestic, then married, but soon there developed a marital maladjustment. She said her husband made her work to support both herself and him; later said he wanted to put her away so he could run around with other women. Finally she developed definitely psychotic symptoms, and on January 21, 1921, was committed to the Elgin State Hospital, Ill. There she presented a catatonic condition, was resistive, untidy, mute. Had a positive Wassermann reaction in the blood, but the psychosis was not judged to be of syphilitic nature or origin. She seemed to improve gradually, and on July 20, 1922, was granted a parole at home. Almost immediately she became worse again, and on August 28, 1922, the parole was revoked and she was institutionalized again, this time in the Chicago State Hospital. At the time of our observation of the case, which was in July, 1932, she was still an inmate there. Shortly after her admission to the Chicago State Hospital she attempted suicide by tying a bedspread around her neck. The hospital case notes, year in, year out, describe her as seclusive, apathetic, with spells of excitement when she becomes profane, scolds, strikes other patients without cause, says they call her names.—Martha has always been normal and a leader in the family to whom everybody turned for advice and help in any difficulty.

Group 31. Mental deficiency complicated with child behavior difficulty; males. Cases 172 in Group 25 and 178 in Group 27 present, as complications, not only infantile palsy and epilepsy, but also child behavior difficulty. In addition we present in this group 5 other cases complicated with behavior difficulty, 199-203.

Case 199. H. twins, Floyd and Lloyd. Born in Dallas, Tex., November 30, 1921. Observed by us in November, 1931, in one of the Long Beach, Calif., city schools. They were 2 years retarded at school. Mental tests, respectively, in 1931 and 1930, revealed, for Floyd, I.Q. 78, for Lloyd, 76.—The home background is very poor, father is said to be shiftless and quarrelsome, family on charity.—Both boys present a behavior difficulty, but Lloyd seems to be the leader, Floyd the follower. Together they have been persistent truants and have been caught in several petty thefts. The family had come to Long Beach about 1½ years prior to our observation of the case. In all that time Lloyd has been in constant trouble with the authorities. He seems to be the leader of a gang of boys who have committed many thefts in the neighborhood and maliciously destroyed property, such as flower beds, trees, shrubs, window panes. Lloyd is defiant of attendance officers and they are considering turning him over to the Juvenile Court.

Case 200. W. twins, Earle E. and Edward N. Born April 11, 1914. Observed by us in March, 1932, in one of the Los Angeles city schools. Mental tests in 1931 revealed, for Earle, I.Q. 77, for Edwin, 121.—Edwin is an excellent student, popular with his schoolmates, prominent in various school activities, president of the senior class. There is also a marked physical contrast, Edwin being the taller by 4 inches.—Earle is doing poorly in studies, not interested, ditches classes about 2 days a week, is generally sulky and sullen, seems to especially dislike his twin-brother and his parents, perhaps from envy of Edwin.

Case 201. H. twins, Vinton and Victor. Born in Kansas, August 13, 1915. Vinton has always been the stronger physically and is taller by 5 inches than Victor. He has, however, been inferior intellectually. At the time of our observation of the case, which was in April, 1931, Vinton was in the "development class" in the Torrance, Calif., elementary school, while Victor was in the first year of high school at Wilmington, Calif. Mental tests, respectively, in 1928 and 1931, revealed, for Vinton, I.Q. 75, for Victor, 99.—Vinton presents a behavior difficulty; he is much larger physically than the other pupils in the school which he attends, is very profane, leads the smaller boys into mischief of all kinds.—Victor presents no behavior problem whatever, "is almost too reserved".

Case 202. J. twins, Richard Clayton and Robert Granville. Born in Bedford, Ind., June 4, 1920. At the time of our investigation of the case, which was in December, 1932, they were both in the fifth grade of one of the Bloomington, Ind., city schools, i.e., about 2 years retarded. Mental tests in 1932 revealed, for Richard, I.Q. 75, for Robert, 89. They also both present a behavior difficulty, in which, however, Robert is distinctly the leader. The behavior difficulty is probably attributable, at least in part, to an unsatisfactory home situation. The mother deserted the family when the twins were still infants. The father re-married, but soon divorced the stepmother. The twins seem to have no supervision. They fight, swear, and steal small things at home and at school. In the classroom they are often impudent and difficult to manage. For a time they took to tormenting a neighboring farmer's hogs with sharpened sticks until one valuable hog died. As already stated, Robert is the leader in mischief, but when they are caught he always lays the blame on Richard.

Case 203. M. twins, Albert and Charles. Part-Indian. Born in San Bernardino, Calif., in 1914. Observed by us in December, 1931, in one of the Anaheim, Calif., city schools. Mental tests in 1931 revealed, for both, I.Q. 74. The problem is petty theft. When the children at the school miss things, they are very often found in the possession of the twins. Of the two, Albert is described as "the sly one" and Charles as "the bully", but they always work together and are said to be equally at fault.

Group 32. Mental deficiency complicated with child behavior difficulty; females. Case 196 in Group 30 presents a history of behavior difficulty as well as, later, a psychotic complication. In addition we present here 5 other cases complicated with behavior difficulty, 204-208.

Case 204. M. twins, Dorothy and Mildred. Born in Winthrop, Mass., May 29, 1913. The twins were brought up together and went to the same school, but when they reached the fourth grade Dorothy began to fall behind and gradually developed behavior difficulty, whereas Mildred went ahead without any trouble. Dorothy became restless, disliked school, would complain of pains or illness to evade tasks at school, said the noise of typewriters and the conversation of other children bothered her, was described as slovenly and lazy, developed an attitude of antagonism toward the teachers and toward her family, would have frequent temper tantrums, and finally became quite unmanageable and was referred for diagnosis and recommendations to the Psychopathic Institute of the Jewish Hospital at Cincinnati, Ohio, where she was under observation from September to November, 1928. A mental test in 1928 revealed I.Q. 79. This was in contrast with the result in Mildred's case when her I.Q. had been found to be 110. On November 7, 1928, Dorothy was placed in the Hillcrest school (for delinquent girls) in Cincinnati, and, at the time of our investigation of the case, which was in June, 1931, she was still an inmate there. In the new environment she has shown marked improvement and her temper tantrums ceased.

Case 205. K. twins, Mary and Clara. Born in Los Angeles, February 11, 1917. The home background is one of extreme poverty. The twins were observed by us in March, 1932, in one of the Los Angeles city schools. Both twins are retarded at school, Mary by 3 years, Clara by 2. Mental tests in 1932 revealed, for Mary, I.Q. 77, for Clara, 85. There is no behavior difficulty in Clara's case, but Mary is in considerable trouble. The main problem is stealing, handkerchiefs being the chief item. She is also very untidy, wets herself daily, is very untruthful, unpopular among her school mates; she cries frequently and says the others pick on her. She is also physically under-sized.

Case 206. B. twins, Violet and Viola. Born in Fresno, Calif., February 6, 1917. Observed by us in March, 1932, in one of the Pasadena, Calif., city schools. There is a marked contrast between the twins. Violet is physically much smaller and is subnormal mentally; she has done very poorly at school. Mental tests in 1930 revealed, for Violet, I.Q. 76, for Viola, 117. Violet is very quarrelsome, bullies the younger girls, is impudent to the teacher, "a nuisance in the class room"; she is also very untruthful, blames others for her misdemeanors; cries a great deal, "from temper, not sorrow". Viola does very well in her studies and presents no behavior difficulty.

Case 207. G. twins, Winifred and Dorothy, Born in San Diego, Calif., in 1908. Observed by us in November, 1931, through the courtesy of the San Diego County Health Department. The twins had done poorly at school having reached but the sixth grade. There is no record of mental tests, but they are obviously subnormal in intelligence, estimated I.Q.'s between 60 and 70.—While

still at school Winifred was mixed up in some sexual escapades. Soon after leaving school, she married, but is nevertheless seen on the streets constantly, often with sailors, flashily dressed, bears a poor reputation around town.—Dorothy has also been promiscuous, though not so conspicuously as Winifred. Soon after leaving school she had an illegitimate pregnancy; this resulted in miscarriage due to a venereal infection. Since then she has been under treatment for the venereal infection at the Public Health Clinic.

Case 208. H. twins, Eva Florentine and Edith Ernestine. Born in Roanoke, Va., October 5, 1925. Observed by us in October, 1931, in one of the Long Beach, Calif., city schools. Florentine was then repeating kindergarten, while Ernestine had progressed to the first grade. Mental tests in 1931 revealed, for Florentine, I.Q. 60, for Ernestine, 91. Ernestine presents no behavior problem or difficulty of any kind. Florentine, on the other hand, is a problem both at home and at school. She seems to crave attention constantly and to gain it will throw herself to the floor, pound the floor with her head, or will have a temper tantrum, yelling and kicking. The other children in the kindergarten seem to fear her and will not play with her. A recommendation has been made to put her in a special school for problem children, "not only for her sake, but also for that of the other children in the class".

Group 33. Mental deficiency complicated with juvenile delinquency; males. Ten cases, 209-218.

Case 209. F. twins, Clifford and Clarence. Born in Illinois, November 10, 1918. Clifford was committed to the St. Charles School for Boys, Ill., on October 29, 1931. Clarence was committed to the same institution on November 17, 1931. At the time of our investigation of the case, which was in July, 1932, they were still inmates there. Both were reported as incorrigible. The particular act which led to Clifford's commitment was stealing an automobile in October, 1931. Clarence had stolen "corn and a calf and other property" at various times during the year preceding his commitment; it was also stated in the complaint that "he wanders about the country and is out late at nights on no lawful business". Mental tests in 1931 revealed, for Clifford, I.Q. 78, for Clarence, 73.

Case 210. T. twins, Harley and Earle. Born in Springfield, Mo., April 8, 1912. The twins are both delinquent, but are markedly contrasted in degree of delinquency and in intelligence.—Harley was before the Juvenile Court in 1927, twice in 1928, and again in the early part of 1930. On February, 1930, he was committed to the Preston School of Industry at Ione, Calif., where he remained until March, 1931. His record there was very good and he earned an early parole. At the time of our investigation of the case, which was in March, 1931, he had just been paroled. At the time of his commitment he seemed to be proud of his record of delinquencies, boasted of having committed 16 burglaries and stolen 14 automobiles. He said he got a thrill out of stealing "bigger and bigger things" and did not care what happened to him; but he did not want to get his twin-brother into trouble, so when he was going out "on a job" he made his brother stay at home. He hated school, got only as far as the seventh grade, then quit to go to work. Worked at odd jobs quite consistently, even while thieving. A mental test in 1931 revealed I.Q. 77.—Earle did somewhat better at school, reached the eighth grade before leaving to go to work. Was before Juvenile Court only once, in 1927, for petty stealing, was released on probation and has not been in further trouble since then. A mental test in 1931 revealed I.Q. 92.

Case 211. K. twins, Stanley and Joseph. Born February 2, 1915. Joseph is the larger and stronger of the two, also the more intelligent; but both boys are delinquent. They were admitted together to the St. Charles School for Boys, Ill., on August 21, 1931. At the time of our observation of the case, which was in July, 1932, Stanley was still an inmate there.—In the early part of 1929, Joseph, in company with several other boys, burglarized two houses and stole an automatic gun and other property amounting to nearly \$200. He was also involved with some adults in counterfeiting. At that time he was placed on probation.—In March, 1931, Stanley, in company with some other boys, was arrested for stealing an automobile. He too, was given probation.—On August 6, 1931, both twins, in company with some other boys, stole a Chrysler automobile and were about to go to California in it, when they were arrested; this led to their commitment to the St. Charles School. Mental tests in 1931 revealed, for Stanley, I.Q. 76, for Joseph, 93. Both had done poorly at school, their Educational Quotients being, respectively, 71 and 79.

Case 212. D. twins, Roy Hugh and Charles. Born in Columbus, Ohio, December 17, 1917. Home and neighborhood conditions described as "deplorable".—Roy is the less intelligent, more unstable, and more delinquent of the two. A mental test in 1932 revealed I.Q. 75. He was first brought before Juvenile Court at 6 years, for setting fire to a house. He has been in court 6 times since then. He has been doing petty stealing from houses and stores since the age of 8 years. In February, 1932, Roy, Charles, and 4 other boys were arrested for breaking into several railroad cabooses and stealing food and clothes amounting to \$50. In June, 1932, Roy was again arrested together with 3 other boys, for breaking into 50 or more refrigerator cars. On June 4, 1932, he was placed in the Boys' Industrial School at Lancaster, Ohio. At the time of our observation of the case, which was in July, 1932, he was still an inmate there. His record at the institution had been rather poor so far, marked by "disobedience, impudence, and fighting".—Charles has been before the Juvenile Court 5 times, twice for truancy, twice for stealing, and the last time, in February, 1932, for participating with the gang in breaking into the railroad cabooses, as mentioned above. He was then let off with a suspended sentence. There is no record of a mental test in his case.

Case 213. G. twins, Kenneth and Carl. Born in Van West, Ohio, December 14, 1917. The father is in the Ohio Penitentiary for grand larceny; he had encouraged the twins to steal and to defy the law.—Kenneth is definitely subnormal in intelligence; a mental test in 1930 revealed I.Q. 68. In Carl's case there is no record of a mental test.—At school Kenneth fought his teachers because "they tried to run him". On September 15, 1928, Kenneth was committed to the Boys' Industrial School at Lancaster, Ohio, for "wrecking a train, burglary, stealing a bicycle, puncturing automobile tires, and using profane and obscene language". On March 4, 1930, he was released on parole, but had to be returned on April 9, 1930. At the time of our investigation of the case, which was in July, 1932, he was still an inmate there.—Carl had also been before Juvenile Court repeatedly. The court records contain the following statement: "Wholly bad and vicious; record of continuous violations of the law; has been associated with his twin in practically all his misdemeanors. Carl is a confirmed blackguard and liar. They are probably the worst pair we have had before the court". Carl was committed to the Boys' Industrial School at Lancaster, Ohio, on February 9, 1930; escaped March 8, 1930; returned April 10, 1930; escaped again September 11, 1930; returned again March 20, 1931; paroled September 2, 1931. On December 15, 1931, he fell from a roof he was climbing and was killed.

Case 214. S. twins, Joseph and John. Born in Blackstone, Mass., November 1, 1915. Joseph has always been the smaller and weaker of the twins physically and of subnormal intelligence. A mental test in 1931 revealed I.Q. 66. Home conditions good. He caused no trouble until he left school at about 16 years. At that time he began to stay out late, would not appear for meals, went around with boys mostly younger than himself. In December, 1931, he and two other boys stole a car, ran it about a block, crashed into a telephone pole, then got out and ran away. At home he got a gun, shot a bullet through a door and another through the fleshy part of his hand. On December 16, 1931, he was placed in the Sockanosset School for Boys at Howard, R. I. At the time of our investigation of the case, which was in August, 1932, he was still an inmate there.—There is no record of any mental test in John's case. He is described, however, as normal and well adjusted in every way, and is self-supporting.

Case 215. D. twins, Lottie (boy) and Andy. Born in East Orwell, Ohio, September 24, 1915. The mother died when the twins were 4 years old. Father re-married. Home very poor and crowded. Counting the step-brothers and sisters, there were 17 people living in a small four-room house. The twins have been before Juvenile Court repeatedly for stealing, mainly food, chickens, milk from porches, supplies from ice boxes, etc. On the occasion of his last appearance in court, Andy was given a suspended sentence and has been working at odd jobs on neighboring farms. In the early part of 1932 Lottie stole some money from a neighbor's house, and on May 4, 1932, was sent to the Boys' Industrial School at Lancaster, Ohio. At the time of our observation of the case, which was in July, 1932, he was still an inmate there. A mental test in 1932 revealed I.Q. 64.—There is no record of a mental test in Andy's case; but he, too, is judged to be subnormal in intelligence.

Case 216. N. twins, Peter and Joseph. Born in South River, N. J., February 2, 1914. These boys were committed together for "incurability" in February, 1927, to the State Home for Boys at Jamesburg, N. J. Under outside pressure and against the advice of the parole committee they were released on parole in August, 1928. They were returned as parole violators on September 10, 1929. Soon thereafter they were transferred to the State Colony for Feeble-Minded Males at New Lisbon, N. J. At the time of our investigation of the case, which was in August, 1930, they were still inmates there, "behaving as well as could be expected, Peter working in the dining room and Joseph in the store room". Mental tests in 1928 revealed, for Peter, I.Q. 64, for Joseph, 59.

Case 217. F. twins, Flenard and Odie. Born in Tennessee, February 5, 1916. Part-Negro. Parents seem to be subnormal in intelligence, very poor, home is dirty.—In 1928 and 1929 Flenard was before the Juvenile Court four times for stealing, breaking into a print shop, and breaking into a commission house. On June 5, 1929, he was finally committed to the Boys' Industrial School at Lancaster, Ohio; escaped July 19, 1930; granted parole August 1, 1930; discharged from parole October 2, 1931, to let him return to his parents in Tennessee.—Odie was first brought before the Juvenile Court at the age of 13 years for stealing. He has been in court for similar offenses four or five times since then. The last time he burglarized a store and was committed to the Boys' Industrial School at Lancaster, Ohio, on March 18, 1932. At the time of our investigation of the case, which was in July, 1932, he was still an inmate there. He is described as "incurable at home, in school, and on the streets". Mental tests, respectively, in 1929 and 1932, revealed, for Flenard, I.Q. 62, for Odie, 56.

Case 218. C. twins, Sidney and Thomas. Born in Toronto, Ont., Canada, May 19, 1914. The mother is of subnormal intelligence; an older sister of the twins is an imbecile, one brother has dementia praecox, another brother is considered psychopathic.—The twins were born in the eighth month of gestation and both were retarded in walking and talking. They have been together in all their delinquencies, Thomas invariably as the leader, Sidney as the follower. In June, 1923, they were before the Juvenile Court for getting into 2 houses under construction and doing about \$700 worth of damage. In November, 1923, they were again in court for breaking into a house and stealing. They were at first given probation, but their delinquencies continued, and on February 7, 1924, they were committed together to the Ontario Hospital at Orillia, Canada. At the time of our observation of the case, which was in August, 1932, they were still inmates there. Mental tests, respectively, in 1923 and 1928, revealed, for Thomas, I.Q. 85, for Sidney, 53.

Group 34. Mental deficiency complicated with juvenile delinquency; females. Case 183, in Group 28, presents juvenile delinquency as well as epilepsy complicating the mental deficiency. In addition we present here 6 other cases complicated with juvenile delinquency, 219-224.

Case 219. S. twins, Beulah and Eulah. Born in Imperial Valley, Calif., November 14, 1914. Beulah is the less intelligent of the twins, also the first to have gotten into difficulty. The twins have a second step-mother. In February, 1928, Beulah was first brought before the Juvenile Court as "incorrigible, disobedient, running out at night"; she had attempted suicide by drinking tincture of iodine; vaginal smear revealed venereal infection. She has since been before the court on two other occasions, was cared for in the Convent of the Good Shepherd from December, 1928, to March, 1929, and finally was committed to the Los Angeles County institution for delinquent girls (El Retiro) on June 11, 1930. She escaped from there on August 4, 1930, was returned the same day, and was still an inmate there at the time of our observation of the case, which was in January, 1931. A mental test in 1930 revealed I.Q. 79.—Eulah has a much higher intelligence; in her case a mental test in 1928 revealed I.Q. 112. But she has also been a sex delinquent. She is described as of erratic temper, stubborn, unmanageable. First brought before the Juvenile Court in January, 1929. She was then put on probation, but violated the same, and on July 1, 1929, was placed in the Convent of the Good Shepherd. From there she was released on March 7, 1930, but soon got into trouble again and on October 3, 1930, was committed to El Retiro (Los Angeles County institution). On December 15, 1930, she ran away from there, but was picked up within 2 days and placed in Juvenile Hall. At the time of our investigation of the case, in January, 1931, she was still in Juvenile Hall awaiting further court action.

Case 220. McC. twins, Edith and Gertrude. Born in Toronto, Ont., Canada, July 23, 1914. Home conditions unsatisfactory; father has a jail record; mother drinks and has a bad reputation. Edith has been a habitual truant from school and has been involved in some petty thefts. Gertrude has been a sex delinquent from the age of 12 years; at that age she was first brought to the attention of the Juvenile Court. She was released, but continued to be promiscuous sexually, and in June, 1931, was discovered to be pregnant and a blood test proved positive for the Wassermann reaction. On June 7, 1931, both twins were committed to the Groves School for Delinquent Girls in Toronto for supervision until they would become of age. At the time of our observation of the case, which was in August, 1932, they were still inmates there. Mental tests in 1926 revealed, for Edith, I.Q. 78, for Gertrude, 86.

Case 221. B. twins, Lila and Lola. Born in Bagley, Iowa, September 30, 1914. Mother is an invalid, has had 3 miscarriages in past 3 years, also lost a set of triplets. The girls were known in the neighborhood as "high fliers, out nights, lazy, irresponsible". On June, 1930, they were reported by the family to the police as missing. On July 3, 1930, Lila was arrested in a drunken condition and taken to Juvenile Hall in Los Angeles. She then told of Lola and herself having started for Oregon by hitch-hiking; but they returned to Los Angeles and there lived with various men for several weeks. Lola then went off with some man and has not been heard from since. Lila was found to have a gonorrheal infection with kidney involvement; she remained under treatment in Juvenile Hall until September 4, 1930, when she was transferred for further treatment to the Los Angeles County General Hospital. Following her discharge from there in October, 1930, she, too, has been lost track of. A mental test in Lila's case in 1930 revealed I.Q. 69. There is no record of any mental test in Lola's case.

Case 222. F. twins, Lily and Pansy. Born in Peoria, Ill., June 29, 1913. These girls were cared for in an orphanage until the age of 9 years when they were placed in a foster home. As they matured, they became unmanageable and disobedient, persisting in running around with men at all hours. The orphanage refused to take them back, and in the summer of 1930 they were brought before the Juvenile Court. Both were placed on probation after employment had been secured for them as domestics. They did well as far as their work was concerned and there has been no further difficulty with Pansy. But Lily had to be repeatedly scolded for being out late, sometimes until 2 a.m., and finally, in November, 1930, she disappeared and was not located again until January 4, 1931. It was learned that she had been living with one man after another, associated with bootleggers, had been an inmate of a house of prostitution, etc. Accordingly, on February 20, 1931, she was committed to the State Training School for Girls at Geneva, Ill. At the time of our observation of the case, which was in July, 1932, she was still an inmate there. A mental test in 1931 revealed I.Q. 60.—There is no record of any mental test in Pansy's case. Pansy is not classified as a juvenile delinquent, but as having presented a child behavior difficulty.

Case 223. S. twins, Nora and Dorothy. Born in Hamilton, Ont., Canada, July 27, 1917. The twins were born at full term, but the birth was difficult and accomplished with the aid of forceps. They attended a parochial school.—Nora proved hardly teachable and became almost at once such a sex delinquent that she was considered a menace to the other children and the Sisters refused to have her at the school. As she approached maturity she became more and more of a problem, would run away from home, was having illicit relations with men, and finally the Big Sisters Association arranged for her commitment to the Ontario Hospital at Orillia, Canada, on December 11, 1931. At the institution she was found to be "a distinct sex problem"; also showed schizoid traits: "constantly grimacing and blinking; whenever approached she covers her face with her hands and will not look up; answers only in low monosyllables". A mental test in 1931 revealed I.Q. 57.—Dorothy is much brighter, reached the sixth grade at 13 years. There is no record of a mental test, but her I.Q. is estimated at 85 or 90. At 13 years she, too, had become a persistent sex delinquent, was considered incorrigible, and was committed for an indefinite period to the Home of the Good Shepherd.

Case 224. S. twins, Madeline Pearl and Viola Jane. Born in Merlin, Ont., Canada, January 10, 1915.—The home background is poor; mother is epileptic and sexually promiscuous. The girls had "a bad reputation" from childhood.

—Madeline served a term in the London Jail, Ont., "for indecent exposure", from July 16 to September 21, 1930; and another term "for lewd and licentious conduct", from May 23 to June 7, 1932. She was then committed to the Ontario Hospital, London. At the time of our observation of the case, which was in September, 1932, she was still an inmate there. In 1931 she had given birth to an illegitimate child (still-born). A mental test in 1932 revealed I.Q. 45. On admission to the hospital she was found to have a gonorrheal infection. The admission note states also that she was "profane in her language; kicked the nurse in the face; threatened suicide; talked chiefly of sexual experiences; at times refused food".—Viola, too, is obviously of sub-normal intelligence, judged to be on the level of high grade moronism or borderline; works as domestic on a farm and "does not have a very good reputation". However, she has not been in conflict with the authorities and is not considered to be definitely delinquent.

Group 35. Mental deficiency complicated with adult criminality; males. One case, 225.

Case 225. M. twins, Samuel and Morris. Born in Detroit, Mich., July 11, 1913. They were "unwanted children". Samuel seems to be the less delinquent of the two; both have a speech defect, but Samuel's is the less pronounced; Samuel is also somewhat the more intelligent; mental tests in 1929 revealed, for Samuel, I.Q. 73, for Morris, 66. Samuel is classified not as presenting a case of adult criminality, but as a juvenile delinquent, as he seems to have gotten along without serious difficulty since he attained the age of 18 years. Morris, however, at the time of our investigation of the case, which was in June, 1932, was serving an indeterminate sentence of 5 years to life in San Quentin Prison, Calif. Both twins were troublesome from early childhood; reported by parents as uncontrollable and incorrigible; did poorly at school, disliked school, played hookey. They quarreled with each other and were hardly ever together. Both sought odd jobs to make money for clothes, to go to dances, "for a good time". Morris had run away from home repeatedly for days or weeks at a time. They have been before Juvenile Court repeatedly on charges of "unlawful use of automobile", traffic violations, larceny, robbery "carrying an unregistered gun", etc.

Group 36. Mental deficiency complicated with adult criminality; females. Two cases, 226-227.

Case 226. R. twins, Minnie and Ethel. Born in Brooklyn, N. Y., May 17, 1913.—Minnie left school at 14 years "because of a fit of melancholia". Since then she has shown much instability, would stay out late nights and refuse to account for her comings and goings, would frequent night clubs in the colored section of the city, was promiscuous sexually, especially with colored men, had an illegitimate pregnancy and an induced abortion in 1931, was described as a "street walker". In the spring of 1932 she was placed in the Kings County Psychopathic Hospital, Brooklyn, for mental observation, but was pronounced "not insane, but unstable, neurotic, and impulsive". She was committed to the Westfield State Farms (Reformatory for Women) at Bedford Hills, N. Y., on May 10, 1932. At the time of our observation of the case, which was in November, 1932, she was still an inmate there. A mental test in 1932 revealed I.Q. 77.—Ethel has been normal in every respect, had a course in business college, and has been steadily employed and highly regarded by her employers over a period of years. No record of a mental test, but she is obviously of average intelligence or above.

Case 227. C. twins, Rose and Lillian. Born in West Springfield, Mass., May 3, 1897.—The home background is very poor. Mother is illiterate and has an "extremely poor reputation"; is said to have encouraged the twins in their drinking and sexual promiscuity; both brothers have court records for theft and drunkenness; an older sister is epileptic; another sister has dementia praecox; none of the children in the family got beyond the fifth grade in school. The home is in a wretched neighborhood, disorderly, dirty, and has been under police surveillance as a suspicious resort.—Rose has worked at odd jobs, but is usually idle.—In 1914 the twins ran away from home and were found later dressed in boys' clothes, living in a shack by the river, and were arrested for "immorality and drunkenness". Lillian had been arrested on similar charges in 1913. Both have had illegitimate children and were infected with both gonorrhea and syphilis.—Lillian has a congenital club-foot. She served a term in the Massachusetts House of Correction from January 20, 1919, to June 19, 1919. No record of a mental test in her case, but she is obviously of sub-normal intelligence, estimated as in the degree of high grade moronism or borderline.—Rose was in the Massachusetts Reformatory for Women at Framingham from August 26, 1918, to April 7, 1920; again from April 11, 1922, to April 10, 1924; committed there for the third time on March 10, 1932. At the time of our investigation of the case, which was in August, 1932, she was still an inmate there. A mental test in 1923 revealed I.Q. 60. In the intervals between her residence in the reformatory she was an inmate of houses of prostitution, "an eye sore on the streets", a hustler for her "pimp husband".

Summary of Findings in Dizygotic Same-Sex Twins.

We have presented 101 pairs of dizygotic same-sex twins with mental deficiency in one or both of each pair: 41 pairs of male twins and 60 pairs of female twins.

The distribution of intelligence quotients among the 202 individuals is as shown in Table VII.

TABLE VII
DISTRIBUTION OF INTELLIGENCE QUOTIENTS IN THE DIZYGOTIC SAME-SEX TWINS

	Males	Females	Total
I.Q. under 20.....	3	1	4
20-29.....	3	3	6
30-39.....	2	—	2
40-49.....	3	6	9
50-59.....	10	11	21
60-69.....	12	17	29
70-79.....	23	33	56
80-85.....	—	4	4
85 or over.....	8	15	23
Mentally deficient, I.Q. unascertained....	9	15	24
Normal intelligence, I.Q. unascertained..	9	15	24
Total	82	120	202

The differences in I.Q. between the twins in the pairs vary as shown in Table VIII.

TABLE VIII

DIFFERENCES IN POINTS OF I.Q. BETWEEN TWINS IN DIZYGOTIC
SAME-SEX PAIRS

	Points of difference in I.Q.						Total
	0-5	6-10	11-15	16-20	21-25	Over 25	
Number of ascertained cases	18	11	7	3	4	44	87
Per cent of ascertained cases	20.7	12.6	8.1	3.4	4.6	50.6	100

As in the preceding section, this part of the material, too, has been classified according to complicating conditions present. The results are presented in Table IX. Here again the total figures exceed the number of individuals represented, because some few cases are counted more than once on account of presenting two or more complications.

TABLE IX

THE MATERIAL CLASSIFIED ACCORDING TO EXISTING COMPLICATIONS
(DIZYGOTIC SAME-SEX TWINS)

	Males	Females	Totals
Uncomplicated mental deficiency.....	31	52	83
Mental deficiency with paralysis.....	2	3	5
" " " epilepsy	6	14	20
" " " psychotic disease	2	8	10
" " " behavior difficulty	9	8	17
" " " juvenile delinquency	18	11	29
" " " adult criminality	1	3	4
Normal intelligence (I.Q. 85 or over) with complications	4	5	9
" " " " " without "	13	25	38
Totals	86	129	215

In order to facilitate further the comparison of the findings in dizygotic same-sex twins with those in monozygotic twins we submit Table X, prepared in a manner corresponding to Table V in the preceding section. The results of the comparison will be discussed in a subsequent section.

TABLE X

DEGREE OF CONCORDANCE IN I.Q. IN CASES WITH AND WITHOUT COMPLICATIONS
(DIZYGOTIC SAME-SEX TWINS)

	Uncomplicated Cases	Cases with Complications
Both affected, similarly.	28.3%	11.9%
Both affected, dissimilarly.	37.0%	16.7%
One affected	34.8%	71.4%

We submit, finally, in Table XI, a summarized statement of the distribution of the complications in the twin-pairs, indicating their various combinations. This table has been prepared in the same way as Table VI in the preceding section and is comparable with it. Here, too, each twin is counted at least twice—as “propositus” and as “other twin”; and in a number of instances an individual appears in the table three or more times, depending on the number of complications in his case.

TABLE XI
DISTRIBUTION OF THE COMPLICATIONS IN THE DIZYGOTIC SAME-SEX TWIN-PAIRS

	Propositi	The other twins							Totals
		Uncomplicated mental deficiency	Infantile Palsies	Epilepsy	Psychotic Disease	Behavior Difficulties	Juvenile Delinquency	Adult Criminality	
Uncomplicated mental deficiency....	83	60	1	7	—	1	1	—	85
Infantile Palsies	5	1	—	—	—	—	—	—	5
Epilepsy.	20	7	—	—	1	—	1	—	20
Psychotic Disease	11	—	—	1	6	—	—	—	12
Behavior Difficulties	18	1	—	—	—	8	1	—	18
Juvenile Delinquency	35	1	—	1	—	1	32	3	39
Adult Criminality	4	—	—	—	—	—	3	2	6
Normal Individuals	39	15	4	11	5	8	1	1	45
Totals	215	85	5	20	12	18	39	6	230

As may be seen almost at a glance, the data presented in Tables VI and XI present some striking contrasts, as well as some equally striking similarities. A further consideration of these will be undertaken in a subsequent section.

§ 5. *Opposite-Sex Twins.*

Group 37. Uncomplicated mental deficiency; both affected, similarly. Fifteen cases, 228–242.

Case 228. H. twins, Ray and Arlie Mae. Born March 7, 1921. Observed by us in April, 1932, in one of the Los Angeles city schools. Mental tests in February, 1930, revealed, for Ray, I.Q. 79, for Arlie Mae, 82.

Case 229. D. twins, John and Jennie. Born November 26, 1913. Observed by us in March, 1932, in one of the Los Angeles city schools. Mental tests in March and May, 1928, respectively, revealed, for John, I.Q. 77, for Jennie, 82.

Case 230. M. twins, Louis and Esperanza. Part-Indian. Born in California in August, 1919. Observed by us in January, 1932, in one of the Los Angeles city schools. Mental tests in 1930 revealed, for Louis, I.Q. 77, for Esperanza, 72.

Case 231. B. twins, Nellie and John. Born in New York, March 15, 1919. These twins were admitted together to Letchworth Village, Thiells, N. Y., on May 27, 1925. They remained there until January 11, 1928, when they were both discharged, Nellie to the custody of an aunt and John to his parents. Mental tests in June and July, 1927, respectively, revealed, for Nellie, I.Q. 76, for John, 78. At the time of our investigation of the case, which was in January, 1931, the twins were living at large, the one with an aunt, the other with the parents.

Case 232. M. twins, Adolfo and Amelia. Part-Indian. Born in San Bernardino, Calif., in March, 1918. Observed by us in January, 1932, in one of the Los Angeles city schools. Mental tests in 1931 revealed, for Adolfo, I.Q. 75, for Amelia, 74.

Case 233. McV. twins, Geraldine and Bernard. Born in Johnstown, Pa., December 1, 1916. Difficult birth, Geraldine had cord around the neck, was cyanotic, had to be resuscitated; Bernard had "spinal meningitis" (convulsions?) at 3 months. Both were retarded in walking and talking and later did poorly at school. Observed by us in October, 1931, in one of the Los Angeles city schools. Mental tests in 1931 revealed, for Geraldine, I.Q. 74, for Bernard, 71.

Case 234. P. twins, Wilda and Willard. Born in Anaheim, Calif., in 1914. Observed by us in December, 1931, in one of the Anaheim city schools. Mental tests in 1931 revealed, for Wilda, I.Q. 73, for Willard 71.

Case 235. S. twins, Mario and Mary. Born in Stuton, Ill., July 11, 1916. Both have done poorly at school and have been transferred to an "opportunity room". Observed by us in January, 1931, in one of the Santa Monica, Calif., city schools. Mental tests in 1928 revealed, for Mario, I.Q. 69, for Mary, 67.

Case 236. G. twins, Philip and Antonia. Born in Los Angeles, Calif., in August, 1922. Observed by us in January, 1932, in one of the Los Angeles city schools. Mental tests in 1930 revealed, for Philip, I.Q. 67, for Antonia, 62.

Case 237. H. twins, Daniel and Eleanor. Born May 27, 1919. Observed by us in May, 1932, in one of the Palms, Calif., city schools. Mental tests in 1931 revealed, for both I.Q. 61.

Case 238. A. twins, Guadalupe and Francisca. Part-Indian. Born in November, 1915. Observed by us in February, 1932, in one of the Los Angeles city schools. Mental tests in 1931 revealed, for Guadalupe, I.Q. 61, for Francisca, 59.

Case 239. L. twins, Mary and Christian. Born in California, August 21, 1918. Christian was placed in the Sonoma State Home, Calif. (for feeble-minded), July 11, 1925. Mary was admitted to the same institution July 26, 1932. At the time of our investigation of the case, which was in September, 1932, they were still inmates there. Mental tests made upon admission to the State Home revealed, for Mary, I.Q. 60, for Christian, 55.

Case 240. H. twins, Charles and Edna May. Born in Reading, Pa., January 17, 1923. They were of illegitimate birth, mother considered feeble-minded,

parents abandoned them, and up to the age of 7 years they were cared for in a foster home. Both were slow in learning to walk; Edna May did not talk until 4 years, and Charles not until 5 years. They proved very difficult to manage on account of their untidy habits, and on February 12, 1930, they were committed together to the Pennhurst State School, Pa. At the time of our investigation of the case, which was in August, 1930, they were still inmates there. Mental tests in 1930 revealed, for Charles, I.Q. 49, for Edna May, 45.

Case 241. B. twins, Bara and Michael. Born in Elizabeth, N. J., April 29, 1919. Two older children in the family are normal. The mother died in giving birth to the twins. By the time the twins were 3 years old it had been recognized that both were feeble-minded; they had not learned to walk, talk, or feed themselves, and had not acquired proper toilet habits. At 3 years both developed whooping cough and became still more difficult to care for. Application was then made for their admission to the State Institution for Feeble-Minded at Vineland, N. J. Michael died of whooping cough before the application was acted upon; and Bara alone was admitted to the institution on July 21, 1922. At the time of our investigation of the case, which was in September, 1930, she was still an inmate there. On admission to the institution Bara was found to have marked hydrocephalus, anterior fontanelle still open, and strabismus. A mental test in 1929 revealed I.Q. 49. No record of a mental test exists in Michael's case, but his deficiency was judged to be of approximately the same degree as Bara's.

Case 242. P. twins, Isaac and Winifred. Born in Artesia, Calif., January 1, 1924. The mother was a primipara over 40 years of age at the time of giving birth to the twins; the father much younger, but unemployed most of the time. The twins were observed by us in October, 1931, in one of the Artesia city schools. There is no record of mental tests, but the twins are obviously feeble-minded of approximately equal degree of imbecility. They seem unteachable and the school authorities have recommended their placement in an institution for the feeble-minded. They have been in the first grade two years and have not learned their letters; neither can speak plainly, make inarticulate noises, mouths open all the time, cannot play with other children; pick up toys and throw them down, frequently smashing them.

Group 38. Uncomplicated mental deficiency, both affected, but in a manner quantitatively dissimilar. Twenty cases, 243-262.

Case 243. F. twins, Elidia and Alfonso. Part-Indian. Born in February, 1923. Observed by us in January, 1932, in one of the Los Angeles city schools. Mental tests in 1931 revealed, for Elidia, I.Q. 77, for Alfonso, 69.

Case 244. R. twins, Carlos and Serafina. Part-Indian. Born in California, in January, 1918. Observed by us in January, 1932, in one of the Los Angeles, Calif., city schools. Mental tests in 1931 revealed, for Carlos, I.Q. 77, for Serafino, 65.

Case 245. M. twins, Delia and Anastacio. Part-Indian. Born in December, 1924. Observed by us in February, 1932, in one of the Los Angeles, Calif., city schools. Mental tests in 1931 revealed, for Delia, I.Q. 77, for Anastacio, 63.

Case 246. H. twins, Thelma and Thedo. Born March 13, 1920. Observed by us in April, 1932, in one of the Los Angeles city schools. Mental tests in 1931 revealed, for Thelma, I.Q. 76, for Thedo, 82.

Case 247. C. twins, Philip and Phyllis. Born in Redlands, Calif., June 30, 1915. Observed by us in one of the Redlands city schools. The father of the twins is prominent and influential; all efforts have been made to help the twins,

but they have done poorly at school in spite of such efforts. Mental tests in 1930 revealed, for Philip, I.Q. 76, for Phyllis, 69.

Case 248. M. twins, Paul and Pauline. Born in California, in April, 1919. Observed by us in February, 1932, in one of the Los Angeles city schools. Mental tests in 1931 revealed, for Paul, I.Q. 75, for Pauline, 84.

Case 249. G. twins, Carmen and Joe. Part-Indian. Born in March, 1921. Observed by us in February, 1932, in one of the Los Angeles city schools. Mental tests in 1931 revealed, for Carmen, I.Q. 75, for Joe, 84.

Case 250. A. twins, Robert and Roberta. Born August 22, 1923. Observed by us in April, 1932, in one of the Los Angeles, Calif., city schools. Mental tests in 1932 revealed, for Robert, I.Q. 75, for Roberta, 82.

Case 251. F. twins, Esperanza and Ignaccio. Part-Indian. Born in October, 1916. Observed by us in February, 1932, in one of the Los Angeles, Calif., city schools. Mental tests in 1931 revealed, for Esperanza, I.Q. 75, for Ignaccio, 68.

Case 252. A. twins, Allyn Arthur and Helen Parker. Born in Omaha, Neb., February 3, 1913. Observed by us in one of the Long Beach, Calif., city schools. The twins come of illustrious ancestry on both the paternal and maternal sides. Nevertheless, they were slow in learning to talk, and, in spite of much special help, have done very poorly at school. Mental tests in 1930 revealed, for Arthur, I.Q. 75, for Helen, 67.

Case 253. R. twins, La Vona and La Marr. Born February 7, 1914. Observed by us in March, 1932, in one of the Los Angeles city schools. Mental tests in 1931 revealed, for La Vona, I.Q. 74, for La Marr, 66.

Case 254. B. twins, Carl and Shirley. Negro. Born in Pasadena, Calif., April 4, 1913. Observed by us in one of the Pasadena city schools in March, 1932. Mental tests in 1931 and 1927, respectively, revealed, for Carl, I.Q. 71, for Shirley, 84.

Case 255. M. twins, Romilda and Domenico. Born in Oakland, Calif., in May, 1920. Observed by us in "atypical class" in one of the Oakland city schools. Mental tests in 1926 revealed, for Romilda, I.Q. 70, for Domenico, 62.

Case 256. K. twins, Anthony and Helen. Born in San Francisco, Calif., September 18, 1919. Observed by us in April, 1931, in one of the San Francisco city schools, Anthony in an ungraded class, Helen in the regular grades. Mental tests in 1927 and 1931, respectively, revealed, for Anthony, I.Q. 69, for Helen, 81.

Case 257. M. twins, Anna and Fred. Born in Harrison, N. Y., February 1, 1913. They were admitted together to Letchworth Village, Thiells, N. Y., July 20, 1927. At the time of our observation of the case, which was in January, 1931, they were still inmates there. Mental tests in 1927 revealed, for Anna, I.Q. 64, for Fred, 80.

Case 258. W. twins, Arthur and Marion. Born in Boston, Mass., May 18, 1900. Both did very poorly at school. Marion was admitted to the Wrentham State School, Mass., on September 14, 1911. At the time of our investigation of the case, which was in August, 1930, she was still an inmate there. On February 17, 1916, Arthur, too, was admitted to the Wrentham State School and remained there until the latter part of 1921, when he was paroled to the custody of his aunt. He got along very well on parole and was officially discharged on November 12, 1925. At the time of our investigation of the case, he was still living with his aunt and getting along quite well. Mental tests in 1921 and 1929, respectively, revealed, for Arthur, I.Q. 59, for Marion, 41.

Case 259. L. twins, Irene and Tommase. Part-Indian. Born in California, June 22, 1923. Observed by us in March, 1932, in one of the Wilmington, Calif., city schools, Irene in a "development room," Tommase in the regular grades. Mental tests in 1931 and 1929, respectively, revealed, for Irene, I.Q. 58, for Tommase, 81.

Case 260. H. twins, Margaret and Andrew. Born in Lancaster, Pa., February 26, 1912. Admitted together to the Pennhurst State School, Pa., October 19, 1920. At the time of our investigation of the case, which was in May, 1931, they were still inmates there. Mental tests in 1927 revealed, for Margaret, I.Q. 57, for Andrew, 45.

Case 261. Van T. twins, Lillie May and Willie Ray. Born in Atchison, Kan., June 4, 1926. These twins were admitted to the State School for Mental Defectives at Winfield, Kan., February 5, 1931. At the time of our investigation of the case, which was in August, 1931, they were still inmates there. Mental tests in 1931 revealed, for Lillie May, I.Q. 38, for Willie Ray, 32. The mother and her 5 other children, siblings of the twins, are all feeble-minded and inmates of the same institution.

Case 262. A. twins, Minnie and Ernest. Born in El Reno, Okla., in 1901. Mother is an imbecile, in an institution for the feeble-minded. The twins were admitted to the Oklahoma Home for Mental Defectives at Enid on August 28, 1914. At the time of our observation of the case, which was in August, 1931, they were still inmates there. Mental tests in 1923 revealed, for Minnie, I.Q. 24, for Ernest 11.

Group 39. Uncomplicated mental deficiency; male twin alone affected. Twenty-five cases, 263-287.

Case 263. L. twins, Miles and Nancy. Born January 22, 1920. Observed by us in April, 1932, in one of the Los Angeles city schools. Mental tests in 1931 revealed, for Miles, I.Q. 79, for Nancy, 88.

Case 264. H. twins, John and Lily. Born October 21, 1919. Observed by us in April, 1932, in one of the Los Angeles, Calif., city schools. Mental tests in 1930 revealed, for John, I.Q. 78, for Lily, 85.

Case 265. R. twins, Edward and Alice. Born in Riverside, Calif., January 2, 1920. Observed by us in November, 1931, in one of the Riverside city schools. Edward weighed $4\frac{1}{2}$ lbs. at birth, Alice $5\frac{3}{4}$ lbs. Edward was slow in learning to walk and talk, and at school spent 2 years each in kindergarten and first grade, whereas Alice made normal progress. Mental tests in 1927 revealed, for Edward, I.Q. 77, for Alice, 90.

Case 266. M. twins, Melan and Margaret. Born in New York in April, 1923. Observed by us in February, 1932, in one of the Los Angeles, Calif., city schools. Mental tests in 1930 revealed, for Melan, I.Q. 75, for Margaret, 96.

Case 267. R. twins, Juan and Cuca. Part-Indian. Born in November, 1923. Observed by us in February, 1932, in one of the Los Angeles, Calif., city schools. Mental tests in 1930 revealed, for Juan, I.Q. 75, for Cuca, 86.

Case 268. D. twins, Merwin and Marjorie. Born in Canada October 6, 1920. Merwin is 2 years retarded at school, has marked reading handicap. Marjorie has made normal progress at school. Observed by us in December, 1930, in one of the San Bernardino, Calif., city schools. Mental tests in 1930 revealed, for Merwin, I.Q. 74, for Marjorie, 115.

Case 269. N. twins, Conrad and Alice. Born October 28, 1914. Our investigation in April, 1931, through the courtesy of the Bureau of Child

Welfare, Berkeley, Calif. Conrad was then in a special class on account of poor progress in studies; Alice has made normal progress. Mental tests in 1924 and 1928, respectively, revealed, for Conrad, I.Q. 73, for Alice, 107.

Case 270. R. twins, Rudolfo and Ruth. Part-Indian. Born in Los Angeles, Calif., in January, 1924. Observed by us in February, 1932, in one of the Los Angeles city schools. Mental tests in 1931 revealed, for Rudolfo, I.Q. 73, for Ruth, 94.

Case 271. E. twins, Fidel and Jovita. Part-Indian. Born in California in March, 1921. Observed by us in December, 1931, in one of the Los Angeles, Calif., city schools. "Fidel is only in the low second grade and seems to make no progress there, while Jovita is in the fourth grade and doing average work." Mental tests in 1931 revealed, for Fidel, I.Q. 73, for Jovita, 92.

Case 272. B. twins, Robert and Roberta. Born in Canada, December 6, 1918. Observed by us in April, 1932, in one of the Los Angeles, Calif., city schools. Mental tests in 1931 revealed, for Robert, I.Q. 72, for Roberta, 89.

Case 273. M. twins, Ramondel and Juana. Part-Indian. Born in October, 1919. Observed by us in February, 1932, in one of the Los Angeles, Calif., city schools. Mental tests in 1931 revealed, for Ramondel, I.Q. 71, for Juana, 94.

Case 274. M. twins, Leopoldo and Maria. Part-Indian. Born in Mexico in May, 1918. Observed by us in January, 1932, in one of the Los Angeles, Calif., city schools. Mental tests in 1930 revealed, for Leopoldo, I.Q. 70, for Maria, 90.

Case 275. T. twins, Edward and Aurora. Born February 13, 1917. Observed by us in April, 1931, through the courtesy of the Bureau of Child Welfare, Berkeley, Calif. The father of the twins is in San Quentin Prison. Aurora was suspected of theft of a pin at school. Mental tests in 1929 revealed, for Edward, I.Q. 70, for Aurora, 89.

Case 276. A. twins, Donald and Vesta. Born in Oakland, Calif., March 19, 1919. Observed by us in March, 1932, in one of the Oakland city schools. Donald had done poorly at school, while Vesta has made good progress, is often on the honor roll. Mental tests in 1929 and 1930, respectively, revealed, for Donald, I.Q. 69, for Vesta, 116.

Case 277. G. twins, Rudolph and Ruth. Born in United States, October 30, 1923. Observed by us in one of the Garvey, Calif., city schools. Mental tests in 1931 revealed, for Rudolph, I.Q. 69, for Ruth, 96.

Case 278. H. twins, Henry and Belina. Part-Indian. Born in California in June, 1920. Observed by us in February, 1932, in one of the Los Angeles, Calif., city schools. Mental tests in 1930 revealed, for Henry, I.Q. 68, for Belina, 92.

Case 279. T. twins, Eugene and Virginia. Born in Los Angeles County, Calif., November 21, 1920. Observed by us in January, 1932, in one of the Compton, Calif., city schools. Mental tests in 1932 revealed, for Eugene, I.Q. 67, for Virginia, 100.

Case 280. T. twins, Philip and Frances. Indian. Born in Riverside, Calif., December 25, 1917. Observed by us in December, 1931, in one of the Riverside city schools. "Philip is wasting his time in school, as he is not getting anything out of his studies; he is shy, very seldom speaks; has no initiative, just lets his work go without trying to get it." Mental tests in 1930 revealed, for Philip, I.Q. 67, for Frances, 87.

Case 281. R. twins, Augustin and Ysobel. Part-Indian. Born in California in June, 1920. Observed by us in February, 1932, in one of the Los Angeles,

Calif., city schools. Mental tests in 1931 revealed, for Augustin, I.Q. 61, for Ysobel, 118.

Case 282. P. twins, Pietro and Francesca. Born in Italy August 1, 1920. Pietro did not begin to talk until the age of 5 years and has never learned to talk plainly; has bulging forehead; requires help in feeding and dressing. He was admitted to the Children's Hospital and School, Randall's Island, N. Y., July 26, 1928, and remained there until September 27, 1929, when he was discharged to the custody of his mother as she was leaving New York. A mental test in 1928 revealed, I.Q. 43.—There is no record of any mental test in Francesca's case, but she is described as a normal child. Our investigation in July, 1931.

Case 283. K. twins, Bertrand and Margaret. Born in San Francisco, Calif., June 2, 1912. Our investigation in March, 1931. Bertrand has been practically unteachable and emotionally unstable and difficult to care for at home. His mother placed him in the Sonoma State Home, Calif., October 31, 1925, but took him home after 2 weeks and entered him in an ungraded class in the San Francisco city schools. A mental test in 1925 revealed, I.Q. 42.—There is no record of a mental test in Margaret's case, but she has shown better than average intelligence, graduated from high school, and is now attending business college (1931).

Case 284. N. twins, Howard and Gladys. Born in Williamson, W. Va., December 31, 1917. Howard was the first-born of the twins; there was a delay in learning to walk, and he did not begin to talk until he was 7 years old. On October 3, 1924, he was placed in the Home School for mentally retarded children in Cincinnati, Ohio, and at the time of our investigation of the case, which was in June, 1931, he was still an inmate there. A mental test in 1929 revealed I.Q. 32.—Gladys "has always been in good health and normal mentally"; there is no record of a mental test in her case.

Case 285. F. twins, Charles R. and Betty. Born in San Diego, Calif., November 15, 1916. Charles was in a private school for mental defectives in Pasadena, Calif., for 8 months in 1928. Then placed in Pacific Colony (for the feebleminded) at Spadra, Calif., on April 9, 1929. At the time of our investigation of the case, which was in January, 1931, he was still an inmate there. A mental test at the Colony revealed I.Q. 21.—Betty has always been normal and wrote us the following letter: "I am his twin. I am in perfect health, am 14 years old, weight 120 lbs., and am a sophomore in high school." No record of a mental test in her case.

Case 286. M. twins, Harry and Pearl. Born in San Francisco, Calif., January 31, 1925. Harry has never learned to walk or talk or to have control of bladder or bowels. He was placed in the Sonoma State Home, Calif., on June 29, 1927, and at the time of our observation of the case, which was in April, 1931, was still an inmate there. A mental test in 1927 revealed I.Q. 21.—There is no record of a mental test in Pearl's case, but she "has started to go to school, is in the first grade, and will be promoted normally" (1931).

Case 287. F. twins, Robert and Anna. Born in St. Albans, N. Y., February 16, 1926. The twins were born at 8 months. Robert was underweight, 4 lbs. 5 ounces. He has never learned to talk, appears to be almost blind, has no control of bladder or bowels. He was admitted to the Children's Hospital and School at Randall's Island, N. Y., on June 30, 1930, and at the time of our observation of the case, which was in July, 1931, he was still an inmate there. A mental test in 1930 revealed I.Q. 19.—There is no record of a mental test in Anna's case, but she walked and talked at 1 year, is evidently a normal child.

Group 40. Uncomplicated mental deficiency; female twin alone affected. Eight cases, 288-295.

Case 288. K. twins, Sarah and Alex. Born in Los Angeles, Calif., in January, 1925. Our observation in December, 1931, in one of the Los Angeles city schools. Mental tests in 1931 revealed, for Sarah, I.Q. 76, for Alex, 87.

Case 289. R. twins, Carmen and Epifanio. Part-Indian. Born in San Bernardino, Calif., in February, 1916. Our observation in February, 1932, in one of the Los Angeles, Calif., city schools. Mental tests in 1931 revealed, for Carmen, I.Q. 76, for Epifanio, 86.

Case 290. L. twins, Marguerite and John. Born July 12, 1914. Our observation in April, 1932, in one of the Los Angeles, Calif., city schools. Mental tests in 1930 revealed, for Marguerite, I.Q. 75, for John, 87.

Case 291. B. twins, Katherine and Eugene. Born in March, 1921. Our observation in April, 1932, in one of the San Pedro, Calif., city schools. Mental tests in 1931 revealed, for Katherine, I.Q. 75, for Eugene, 87.

Case 292. R. twins, Paz and Aurelano. Part-Indian. Born in January, 1922. Our observation in February, 1932, in one of the Los Angeles, Calif., city schools. Mental tests in 1931 revealed, for Paz, I.Q. 70, for Aurelano, 110.

Case 293. R. twins, Mary and Francisco. Part-Indian. Born in July, 1924. Our observation in February, 1932, in one of the Los Angeles, Calif., city schools. Mental tests in 1931 revealed, for Mary, I.Q. 70, for Francisco, 91.

Case 294. F. twins, Alberta and Albert. Born in San Leandro, Calif., February 4, 1921. Our observation in March, 1932, in one of the Oakland, Calif., city schools. Father alcoholic; an older brother of the twins is feeble-minded. Alberta weighed only 1½ lbs. at birth and is still undersized and slightly humpbacked. She makes no progress at school and, at the age of 11 years, is still in the pre-primary grade. Albert is also retarded in his studies, is in the low third grade, "slow section," had to repeat first and second grades. Mental tests in 1928 and 1931, respectively, revealed, for Alberta, I.Q. 47, for Albert, 89.

Case 295. A. twins, Alice and David. Born in New York January 3, 1911. Birth at full term, difficult, instrumental.—Alice proved practically unteachable at school. She was placed in the Children's Hospital and School, Randall's Island, N. Y., July 11, 1924, and remained there until November, 1924, when she was transferred to Letchworth Village, Thiells, N. Y. At the time of our observation of the case, which was in July, 1931, she was still an inmate there. She has a stooped, stalking gait and exhibits athetoid movements of fingers. A mental test in 1924 revealed I.Q. 42.—There is no record of a mental test in David's case, but he is obviously of normal intelligence, has made average progress at school, finished grammar school at 14.

Group 41. Mental deficiency complicated with infantile palsies. Seven cases, 296-302.

Case 296. D. twins, Bertha and Daniel Martin (fictitious names). Born in Hollywood, Calif., January 1, 1917. Parents are in comfortable circumstances. A first cousin of the twins is feeble-minded. Bertha weighed 4 lbs. at birth; Daniel, 3 lbs. Daniel, however, developed normally, and a mental test in his case, in 1928 revealed I.Q. 104.—Bertha had convulsions at 3 weeks; at 9 weeks mother noticed "withering of the left hand"; gradually it became apparent that there was a left hemiplegia. Bertha is further handicapped by stammering. She had done very poorly at studies, was in an "opportunity

room" for 4 years and has been helped by private tutoring. Observed by us in March, 1931, in one of the Santa Monica, Calif., city schools. A mental test in 1927 revealed I.Q. 67.

Case 297. F. twins, Louise and John. Born in Mishawaka, Ind., November 29, 1901.—John developed normally, finished school at 14, then went to work, is a teamster, married, makes a good living for his family.—Louise has never been a healthy child, began to have seizures, light and severe, in early childhood. She did poorly at school, left at 15 years when she had attained but the fifth grade. From the age of about 13 years she has had psychotic symptoms of gradually increasing severity and associated with a progressive deterioration. After school she tried to work in a paper mill and as a domestic, but could not keep a position longer than a week or two. At home she was emotionally unstable, showed disagreeable disposition, would set fire to clothes, run and hide, refused to eat with the family, made use of profane language, attempted suicide, would at times become so violent that she had to be restrained; epileptic seizures continued to occur both day and night, and finally, on February 4, 1932, she was committed to the Logansport State Hospital, Ind. At the time of our observation of the case, which was in July, 1932, she was still an inmate there. On admission to the hospital a physical examination revealed increased knee-jerks, right talipes equino-varus, also ankle clonus and Babinski sign on right side. Recent case notes state: "Excited, restless, many mannerisms, threatens violence to other patients; has also attacked visitors on the lawn." A mental test in 1932 revealed I.Q. 54, but it would be impossible to say to what extent this might be attributed to original mental deficiency and to what extent to deterioration.

Case 298. C. twins, Leslie and Louise. Born in Toronto, Canada, October 25, 1904.—Leslie had some acute illness at 3 years which left him paralyzed on the right side. He proved unteachable in school and never went beyond the first grade; helped around the house at home. He began to have seizures at the age of 21 years, especially at night, two or three times a week; later they became less frequent, occurring about once a month. On December 3, 1930, he was admitted to the Ontario Hospital, London, Canada, and at the time of our observation of the case, which was in September, 1932, he was still an inmate there. For the last 9 months of that time he has been free from seizures. There is no record of a mental test, but he is judged to be a medium grade imbecile.—Louise has never had epilepsy; but she, too, is obviously feeble-minded. She has not been institutionalized.

Case 299. K. twins, Frances and Abraham. Born in New York October 13, 1920.—Frances has had a spastic quadriplegia from birth, more marked on the right side; she is microcephalic, unteachable, can take only soft food, wets and soils. She was admitted to the Children's Hospital and School at Randall's Island, N. Y., on May 3, 1926, and remained there until January 10, 1929, when she was transferred to Letchworth Village, Thiells, N. Y. At the time of our observation of the case, which was in July, 1931, she was still an inmate there. A mental test in 1927 revealed I.Q. 30.—Abraham died at 18 months of diphtheria. He is said to have been a normal infant physically and mentally, walked and talked normally.

Case 300. T. twins, Sophia and Earn. Part-Negro. Born in Chicago in 1906. The early history of these twins could not be ascertained on account of the mother's incoöperation.—Sophia was admitted to the Chicago State Hospital, Ill., March 5, 1931, and was still an inmate there at the time of our observation of the case, which was in July, 1932. At the hospital she was

found to have a partial quadriplegia; frequent and severe seizures, with scars on face and body from falls; psychotic symptoms consisting of confusion, resistiveness, laughing to herself—a progressive deterioration; and mental deficiency, or deterioration, or both, in the degree of low grade imbecility. She was unable, or unwilling, to coöperate in a mental test.—Earn seems to have gotten along without undue difficulty as a laborer and as a soldier in the army, but on June 3, 1925, was admitted to the Elgin State Hospital, Ill., found to be suffering from general paralysis, and died in the hospital on December 12, 1925.

Case 301. C. twins, Mary and Levi. Born in Adams, Mass., April 21, 1888.—Levi had convulsions from birth and died in one at the age of 6 months.—Mary also had convulsions, associated with a left hemiplegia, from birth. On January 19, 1906, she was admitted to the Monson State Hospital, Mass., and died there on May 26, 1932, of pulmonary tuberculosis. At the hospital she averaged 9 grand-mal seizures per month and had an occasional petit-mal seizure. She had proved unteachable at school and was judged to be a medium-grade imbecile. No record of a mental test.

Case 302. S. twins, Jesse and Jane. Born in Marshfield, Ore., in April, 1916.—Jesse was the first-born of the twins, birth was very difficult, delivery was finally accomplished by podalic version and breech extraction. He has never walker or talked, has a left hemiplegia. On May 28, 1926, he was admitted to the Sonoma State Home, Calif., and at the time of our investigation of the case, which was in February, 1931, he was still an inmate there. A mental test in 1925 revealed I.Q. 22.—“Jane has always been perfectly normal,” is in the first year of high school (1931).

Group 42. Mental deficiency complicated with epilepsy. Five cases in Group 41—296, 297, 298, 300, and 301—are complicated not only with infantile palsies, but also with convulsions or epilepsy. We present here, in addition, 21 other cases complicated with epilepsy: 303–323.

Case 303. M. twins, Lawrence B. and Florence. Born in Illinois January 20, 1919. The home situation is unsatisfactory, the children are ill-fed, scolded and beaten. The early history of the twins is unascertained.—Lawrence was admitted to the Lincoln State School and Colony, Ill., March 28, 1927; on April 19, 1928, he was transferred to the Dixon State Hospital, Ill., and at the time of our observation of the case, which was in June, 1932, he was still an inmate there. At the time of his admission he was averaging 12 seizures a year at irregular intervals; under treatment these became less frequent and since December, 1930, he has had none. A mental test in 1927 revealed I.Q. 75.—There is no record of a mental test in Florence's case, but she is obviously of subnormal intelligence, estimated as on the level of high grade moronism. At the age of 13 years she is but in the fourth grade and doing very poorly; her teachers have recommended placement in an institution. Florence has been free from epilepsy, but she presents a behavior difficulty; swears at at her teacher, calls the other children foul names, eats worms, drinks ink, etc.

Case 304. B. twins, Mae and David. Born in Michigan May 23, 1875.—David had convulsions from birth, daily or oftener, and finally died in one at the age of 6 months.—Mae was retarded at school, reached only the eighth grade at 18 years; no mental test, estimated I.Q. 75. At 18 years she fell down a 12-foot embankment, was rendered unconscious and remained so for 24 hours, a month later began to have epileptic seizures and has continued to have them since at the average rate of 3 a week. She was admitted to the Pontiac State Hospital, Mich., September 19, 1917, on account of her epilepsy, and on March 27, 1918, she was transferred to the Wahjamega State Hospital,

Mich. (for epileptics). At the time of our observation of the case, which was in September, 1932, she was still an inmate there.

Case 305. K. twins, Frederick Field and Freda. Born in Melrose Highlands, Mass., May 8, 1906. A maternal aunt is epileptic; mother "very nervous"; paternal grandfather had migraine. The home is one of prosperity and culture. The twins represent the mother's first and only pregnancy. Labor was at full term, but prolonged, difficult, and with use of instruments and anesthesia.—Freda was the first-born, has always been in good health physically and mentally, graduated from high school at 18 years and was on the honor roll, and has been entirely normal since.—Frederick was the second-born; a podalic version was performed, followed by rapid extraction. He weighed 6½ lbs., head rather large; had to be resuscitated; legs and hands seemed paralyzed and he was judged at the time to have sustained a cerebral birth trauma. "He cried practically all the time during infancy and childhood." Had a convulsion when 3 days old and has been having *grand-mal* and *petit-mal* seizures since, the former at the rate of 2 or 3 a year, the latter almost daily and up to several in one day. The paralysis which he seemed to have at birth quickly disappeared, leaving behind merely increased knee-jerks, poor muscular coördination, and divergent strabismus of right eye. There was some delay in learning to walk and talk, as compared with his sister, and he has done poorly in his studies at school. A mental test in 1931 revealed I.Q. 73. In his early adolescence he developed rather marked behavior difficulty, became emotionally unstable, quarrelsome, abusive and threatening toward his mother, and would run away from home and disappear for several days at a time 2 or 3 times a year. On August 1, 1923, he was committed to the Monson State Hospital, Mass. (for epileptics), and at the time of our observation of the case, which was in August, 1932, he was still an inmate there.

Case 306. P. twins, Martin and Sarah. Born in Cincinnati, Ohio, January 23, 1917. Our investigation of the case was in June, 1931, through the courtesy of the Psychopathic Institute of the Jewish Hospital in Cincinnati, where both twins had been under observation.—Martin had convulsions in infancy, but none thereafter. He has since had a problem consisting of persistent bedwetting. The main feature of his case has been that of very poor progress at school; he has not been able to learn to read and write. A mental test in 1924 revealed I.Q. 73, a showing which, of course, does not fully account for his complete reading disability.—Sarah's difficulty has been of a different sort. She has an intelligence well above the average; a mental test in 1928 revealed I.Q. 116. She has done well in her studies at school. She also has a history of bedwetting; talks in her sleep. Has a behavior problem suggesting pre-psychotic manifestations: restless, irritable, unreliable, unable to concentrate, emotionally unstable, now highly elated, and now greatly depressed.

Case 307. C. twins, Albert and Ellen. Born in Welland, Ont., Canada, November 1, 1917. The father served several terms in prison for burglary, and finally deserted the family before the twins were born. The mother died shortly after their birth; cause of death said to have been brain tumor. The twins were brought up in orphanages, but were finally transferred to custodial institutions.—Albert was placed in the Ontario Hospital at Orillia, Canada, on June 2, 1927, and at the time of our observation of the case, which was in August, 1932, he was still an inmate there. A mental test in 1927 revealed I.Q. 70. He has had severe epileptic seizures since early childhood which gradually increased in frequency until they were occurring at the rate of 10 or 12 a month and were preceded by periods of being restless, destructive, untidy, and followed by confusion lasting several hours.—Ellen is in an insti-

tution for the feeble-minded in Montreal, but is free from epilepsy. No record of a mental test in her case.

Case 308. S. twins, Lois Arthur and Lois Arline. Born in Texas in 1905.—Arthur had typhoid fever in early childhood. He did poorly at school and reached but as far as the fourth grade. There is no record of a mental test, but he is obviously feeble-minded, probably in the degree of high-grade moronism. He began to have epileptic seizures at 12 years which increased in frequency until he was having one to three a day. On June 21, 1922, he was committed to the Abilene State Hospital, Tex. (for epileptics), and at the time of our observation of the case, which was in June, 1932, he was still an inmate there.—Arline was free from epilepsy and said to have been of normal intelligence; she died at the age of 22 years following an appendectomy.

Case 309. L. twins, Joseph and Margaret. Born in Boston, Mass., June 10, 1909. The mother is said to have had some mental trouble.—Joseph has had *grand-mal* seizures at the rate of 2 or 3 a year since the age of 6 years. He has done poorly at school and attained but as far as the fifth grade. There is no record of a mental test, but he is obviously feeble-minded, probably in the degree of high-grade moronism. He runs errands and does odd jobs for his father, who has a cobbler's shop. At the time of our observation of the case, which was in August, 1932, he had not been institutionalized.—Margaret did somewhat better at school, finished eighth grade at 17 years, judged to have been of "dull normal" intelligence. She had scarlet fever at 14 years and around 16 years began to show a definite personality change. She became quiet, seclusive, sensitive, worrisome, depressed. After school she went to work as a factory hand, but could not hold any job for more than a short time. Psychotic symptoms developed suddenly in the early part of July, 1929. She became restless, talked in a rambling way, imagined she was pregnant, cried a great deal. On August 20, 1929, she was committed to the Worcester State Hospital, Mass., and on December 19, 1930, she was transferred to the Metropolitan State Hospital at Waltham, Mass. At the time of our observation of the case, which was in August, 1932, she was still an inmate there. Upon her admission to the Worcester hospital, she was restless, cried a great deal, said God had sent a certain fellow to have sexual relations with her. A case note in May, 1932, states: "Periodic spells of confusion and disturbance; unusually indolent and apathetic; incoherent and irrelevant; untidy; manneristic." The hospital diagnosis is dementia praecox. She has never had any manifestations of epilepsy.

Case 310. D. twins, Ellen Jane and Clarence. Born in Hastings, Ont., Canada, July 3, 1913. "The whole family is mentally deficient"; both parents have a prison record; mother now in House of Refuge; 2 brothers and a sister of the twins are in the Ontario Hospital at Orillia (for feeble-minded).—Ellen Jane began to have epileptic seizures in early childhood, both *grand-mal* and *petit-mal*, often complicated with vomiting and headache. She is also mentally deficient and has speech defect. The seizures increased in frequency until she was having them at the rate of from two a week to one or more daily. On July 27, 1924, she was committed to the Ontario Hospital at Woodstock, Canada, and at the time of our investigation of the case, which was in December, 1932, she was still an inmate there. A mental test in 1929 revealed I.Q. 60. On one occasion in February, 1926, she went into *status epilepticus* which was relieved by chloroform. She is inclined to be obstinate, irritable, occasionally violent toward the nurses.—Clarence has been free from epilepsy, but was committed to the Ontario Hospital at Orillia on August 25, 1920, on account of his marked feeble-mindedness. At the time of our investigation of the case, which was in 1932, he was still an inmate there. A mental test in

1931 revealed I.Q. 44. As a rule he is a willing worker at the hospital, but occasionally has mild temper tantrums, tears up his clothing.

Case 311. A. twins, Mabel and John. Born in Detroit, Mich., August 12, 1906.—Father is alcoholic. The twins had 10 brothers and sisters, 3 of whom died of epilepsy and one had an infantile palsy.—Mabel began to have epileptic seizures at the age of 11 years at intervals varying from one or two days to several weeks. Even before the seizures began she presented a behavior problem in the nature of sex delinquency and was taken in hand by the St. Vincent de Paul Society. On December 20, 1920, she was committed to the Farm Colony for Epileptics at Wahjamega, Mich., and at the time of our observation of the case, which was in September, 1932, she was still an inmate there. The seizures are often preceded by a period of being unruly, defiant, profane and obscene in her language. A mental test in 1922 revealed I.Q. 58, but it would be impossible to state to what extent this is attributable to original mental deficiency and to what extent to deterioration.—John has always been in good health physically and mentally, has never had a seizure, finished eighth grade at 14, and has since worked as a chef. No record of a mental test.

Case 312. L. twins, Walter and Bertha. Born in Germany in 1908. Walter was admitted to the Dixon State Hospital, Ill. (for epileptics), on October 19, 1923. At the time of our observation of the case, which was in June, 1932, he was still an inmate there. Case history very meager. Upon admission he was having 10 to 15 seizures a month, but they gradually became less frequent and he had had none at all for over a year prior to June, 1932. His case, however, was complicated with mental deficiency (or deterioration), persistent behavior difficulty, and occasional psychotic symptoms. A mental test in 1926 revealed I.Q. 56. Neurological examination revealed impaired hearing in right ear and increased knee-jerks. He has been very troublesome, quarreling and fighting with other patients; on one occasion struck a patient and broke his nose, on another occasion was caught practicing homosexuality with other patients; on still another occasion he with two other boys broke into the stockroom and stole clothes, tobacco, and matches. He has also been very moody from time to time and in December, 1925, attempted suicide by locking a belt around his neck; was found in a cyanotic condition.—Bertha has always been in good health physically and mentally, free from epilepsy or behavior difficulty, works at home on the farm.

Case 313. B. twins, Betty and Allan. Born in Toronto, Ont., Canada, November 3, 1923.—Case observed by us in August, 1932, through the courtesy of the Toronto Health Clinic, Betty having been a patient at the clinic but never placed in an institution.—Betty is very small for her age; she has had convulsions since infancy, very frequent in first 3 years, as many as 12 in 24 hours, now (1932) has about 2 or 3 a month. She did not walk or talk until past 3 years of age. A mental test in 1932 revealed I.Q. 54.—Allan is a normal, healthy boy, goes to school, is free from seizures; a mental test in 1932 revealed I.Q. 93.

Case 314. S. twins, Gerard and Gilberte. Born in Alfred, Ont., Canada, November 18, 1909.—The parents are cousins; father very quick tempered, deserted the family; mother was epileptic and finally died of eclampsia at birth of the twins; she had had 11 children, including the twins; one uncle also had epilepsy.—Gerard did very poorly at school, attained but the third grade at 14 years, when he left as he was not making any progress. His epilepsy began at 14 years, the seizures being usually nocturnal and occurring at the rate of one to three a week. He was admitted to the Ontario Hospital at Orillia,

Canada, on June 17, 1932, and at the time of our investigation of the case, which was in August, 1932, he was still an inmate there. A mental test in 1932 revealed I.Q. 44.—Gilberte is in good health physically and mentally, teaches school in a neighboring community, is a person of excellent standing. No record of a mental test.

Case 315. E. twins, Clarence Ernest and Clara. Born in Goderich, Ont., Canada, June 1, 1912.—Clarence's case represents a combination of mental deficiency, mild epilepsy, and behavior difficulty from early childhood, culminating in juvenile delinquency. He has always been disobedient, hard to manage, truant from school and home. He proved to be unteachable and can barely write his own name. He has always been in trouble for theft and destruction of property, considered "a menace to the public and especially to young girls." He was in the Bowmanville Reformatory, Ont., from July 16 to October 16, 1923, for stealing a horse and buggy; again from April 27, 1925, to April 27, 1926, for stealing a bicycle; in the Goderich Jail, Ont., from July 9, 1929, to February 10, 1930, for an offense against a young girl; and was finally committed to the Ontario Hospital at London on July 23, 1930. At the time of our investigation of the case, which was in September, 1932, he was still an inmate there. A mental test in 1931 revealed I.Q. 44. About once a month he has spells when he loses consciousness and afterwards has no knowledge or recollection of what happened.—Clara had never been institutionalized, but according to the case history she had epilepsy and died of it at the age of 14 years.

Case 316. B. twins, Richard and Rhoda. Born in Chicago, Ill., in 1906.—Richard did very poorly at school, left at 12 years when he had reached but the second grade. He did equally poorly at work; occasionally for brief periods helped on a neighbor's peddling wagon. He developed epilepsy at 17 years and has continued since then to have convulsions, for the most part at night, at the rate of about two a month. He became increasingly troublesome, and in 1927 was arrested for annoying little girls in the neighborhood. Finally he became quite unmanageable, and on January 11, 1928, was placed in the Cook County Psychopathic Hospital, Chicago, and from there committed about a week later to the Chicago State Hospital on an affidavit of insanity. At the time of our observation of the case, which was in July, 1932, he was still an inmate there. A mental test in 1928 revealed I.Q. 41—possibly in part due to deterioration. At the hospital his psychotic symptoms were marked and made him a difficult patient: antagonistic, in constant quarrels and fights with attendants and other patients, escaped on at least two occasions.—Rhoda has been free from epilepsy and has never been institutionalized. In her case there is no record of a mental test, but she is obviously of subnormal intelligence. She is married, but the husband is out of work most of the time and she takes in washing; she maintains a filthy household, is extremely untidy herself, very dull and without education.

Case 317. S. twins, Walter and Edith. Born in Toronto, Ont., Canada, April 6, 1893.—Walter began having epileptic seizures at the age of 1 month. At first they were frequent and severe, but gradually their frequency was reduced, and since he was 35 years old, they have occurred only about once a year. He did not walk until about 3 years and did not talk until 5 years. Has been unable to go to school and now answers with single words or brief phrases. On March 15, 1911, he was placed in the Ontario Hospital at Orillia, Canada, and at the time of our observation of the case, which was in August, 1932, he was still an inmate there. A mental test in 1931 revealed I.Q. 31.—Edith is free from epilepsy, is married, and in good health. There is no record of a

mental test in her case, but she is obviously of no higher than "dull normal" intelligence. She has 6 children, 2 of whom are obviously mentally deficient.

Case 318. M. twins, Neill Alexander and Harriet. Born in Ontario, Canada, June 9, 1900.—Birth was at full term, but instrumental.—One paternal aunt and one paternal uncle of the twins have had manic-depressive attacks and have been treated in mental hospitals.—Neill Alexander was backward in mental development, has never attended school. No record of a mental test, but his mental deficiency is judged to be on the level of imbecility. He has had epilepsy since the age of 5 or 6 years. Eventually he developed psychotic complications, and on November 19, 1925, was committed to the Ontario Hospital at Whitby, Canada. At the time of our investigation of the case, which was in December, 1932, he was still an inmate there. The hospital diagnosis is "Psychosis with epilepsy and mental deficiency (imbecility)."—Harriet was never in an institution; she was employed as a charwoman in an office building in Toronto and is judged to have been of "dull normal" intelligence. She was free from epilepsy. Killed in a street accident some years ago.

Case 319. G. twins, Anna and Sol. Born in Rochester, N. Y., October 15, 1884.—Anna has shown evidence of mental deficiency since infancy, but helped around the home. At 22 years she began to have epileptic seizures, both *grand-mal* and *petit-mal*, the former mainly at night at the rate of about 6 a year. On April 2, 1908, she was placed in the Craig Colony, Sonoma, N. Y., and at the time of our investigation of the case, which was in August, 1932, she was still an inmate there. No record of a mental test.—Sol has never had epilepsy, is of at least average intelligence, works as a cutter in a clothing factory, is married and provides for his family.

Case 320. McK. twins, Annie Bertha and Finlay J. Born in Camlachie, Ont., Canada, September 21, 1884.—Annie Bertha is of stunted growth, almost a dwarf, and very stout. She has been mentally deficient from infancy and has never gone to school. Developed epilepsy at 14 years; seizures were frequent and severe, especially at night, and gradually led to deterioration and psychotic complications. Eventually, she could no longer be cared for at home, and on October 4, 1918, she was committed to the Ontario Hospital at London, Canada. At the time of our observation of the case, which was in September, 1932, she was still an inmate there. No record of a mental test. As a rule she is seclusive, incoöperative, resistive, irritable when approached, cries easily; at times, she is excited, noisy, restless, incoherent in conversation, very hard to control.—Finlay J. is also of dwarfed stature and rather eccentric; but he is a successful farmer, visits his sister frequently, pays for her maintenance in the institution, is free from epilepsy and psychotic trouble.

Case 321. U. twins, John Howard and Geraldine. Born in Portland, Ore., November 21, 1926.—John Howard had an attack of scarlet fever at the age of one month, and to this his mother is inclined to attribute both his mental deficiency and his epilepsy. His teething began at 7 months, and at the same time the seizures appeared. At first, he was having 3 or 4 "light spasms" a day, but the seizures gradually increased in severity and to some extent in frequency—up to 7 a day. He has never learned to walk or talk. On January 10, 1931, he was placed in the State Institution for Feeble-minded at Salem, Oregon. At the time of our investigation of the case, which was in June, 1931, he was still an inmate there. A mental test in 1931 revealed I.Q. 20.—Geraldine is a normal child, possibly of superior intelligence, and is entirely free from epileptic manifestations.

Case 322. H. twins, Robert and Wanda. Born in San Bernardino, Calif., April 19, 1924. The twins were born 3 weeks prematurely and were delivered

by Cesarean section.—Robert had *icterus neonatorum*. At 3 months of age he began to have convulsions at the rate of about one a month, but otherwise seemed to be developing normally; he learned to walk, talk, and feed himself. At the age of 2 years 10 months he had a series of convulsions lasting 36 hours. Since then he has not talked, has had to be fed, dressed, etc., being unable to do anything for himself; soils and wets; has seizures at irregular intervals from once in 2 weeks to many a day. On March 27, 1927, he was placed in the Sonoma State Home at Eldridge, Calif., and at the time of our observation of the case, which was in April, 1931, he was still an inmate there. A mental test in 1927 revealed I.Q. 17.—Wanda is a normal child, free from epilepsy, is in the first grade in school and gets along well. No record of a mental test.

Case 323. G. twins, Marian May and George. Born in Worcester, Mass., September 2, 1918.—A paternal aunt of the twins is said to be defective and delinquent; the mother, too, is said to be subnormal mentally.—Marian May was born by breech presentation and was a "blue baby." She began to have convulsions at 6 months at the rate of one or two a month, but occasionally in series lasting all night. From two to four years she was free from them, but they began again and have since continued at the average rate of four a week. She has never talked, makes inarticulate noises and gestures. Walks and feeds herself; has choreiform movements; is very untidy. At times becomes tempestuous, screams, hits, bites. On October 22, 1922, she was placed in the Hospital Cottages for Children at Baldwinville, Mass., from where she was transferred to the Monson State Hospital, Mass., on December 7, 1923. At the time of our observation of the case, which was in August, 1932, she was still an inmate there. No record of a mental test, but her mental deficiency is judged to be in the degree of idiocy.—George is a normal boy, free from epilepsy, goes to school, makes good progress.

Group 43. Mental deficiency complicated with psychotic disease. Seven cases have already been presented in which the mental deficiency is complicated not only with infantile palsies or epilepsy, but also with psychotic symptoms: two cases in Group 41 (297 and 300), and five cases in Group 42 (309, 312, 316, 318, and 320). We present here, in addition, six other cases complicated with psychotic disease: 324-329.

Case 324. A. twins, Helen and Moe. Born in Brooklyn, N. Y., September 25, 1910.—Helen presented no problem in childhood and made approximately normal progress at school up to the age of about 13 years, when she reached the seventh grade. At that time a change developed in her. She found the work at school too hard for her, could not get ahead, refused to go to school; also refused to help around the house or to do any work. She then ran away from home, was found and brought back by her father, but soon ran away again. In the course of 2 or 3 years she was found to be increasingly unmanageable and finally, in the latter part of the summer of 1926, she was found living with another girl and a man and suffering from a pelvic infection, and was arrested as "a wayward minor." On September 16, 1926, she was placed in the Kingston Avenue Isolation Hospital, Brooklyn, N. Y., and remained there under treatment until October 5, 1927, when she was transferred to the Westfield State Farm, Bedford Hills, N. Y. On September 10, 1928, she was granted a parole in the custody of her parents. Five months later she disappeared from home again, and a month after that was found living in an apartment with two other girls and three men. She had been drinking heavily; the men were notorious gangsters and bootleggers. Accordingly, on March 4, 1929, she was placed again in the Bedford Hills institution. In the course of both her first and second sojourns in that institution she was observed to have

from time to time psychotic spells apparently of manic-depressive type. "At periodic intervals she becomes excited, over-talkative, and displays characteristic hypomanic activities; invariably breaks glass when this is available. These periods are of short duration, although the cycles are seemingly becoming more frequent, the last two having occurred within a week of one another. During these episodes she is fully oriented, not hallucinated, but gives expression to fanciful ideas; *e.g.*, stated that she had gone to Arizona that same day and returned." On account of these spells she was transferred, on March 4, 1929, to the Matteawan State Hospital (for criminal insane) at Beacon, N. Y. There she remained until September 17, 1929, when she was returned as "much improved," to the Bedford Hills institution. On December 10, 1929, she was again granted a parole. After 3 months she disappeared once more from home, went to Saratoga Springs, N. Y., and became an inmate of a house of prostitution. On November 18, 1930, she was arrested, and on December 12, 1930, was committed to the Albion State School, N. Y. (reformatory for girls). From there she was sent back to the Bedford Hills institution on January 27, 1932, and on March 10, 1932, she was granted parole for the third time. This time she got along very well for a while, held one job for several months, rendered satisfactory service, and even received a raise in salary. Then she disappeared again, was found and taken over by the Jewish Board of Guardians. Another job was obtained for her and she did very well for a month, although she appeared quite nervous. On October 20, 1932, she was once more arrested for prostitution, but because she displayed psychotic symptoms again, she was, on October 28, 1932, placed in the Psychopathic Pavilion, Bellevue Hospital, New York City. At the time of our observation of the case, which was in the early part of November, 1932, she was still an inmate there. A diagnosis of psychopathic personality with episodes of elation, irritability, excitement, and sexual misbehavior was made there, an unfavorable prognosis was rendered, and it was recommended that she be returned to the Bedford Hills institution. A mental test in 1927 revealed I.Q. 79. In the course of her many escapades she had used at least two aliases. She was described by a representative of the Jewish Board of Guardians as "a pathetic figure; she tries very hard with each new chance to do better; one of the jobs was very disagreeable and many people had refused it, but she took it and for a time tried to do her best; but she seems to last only a few months at the most."—Moe has never presented any problem; attended high school for 2 years, then learned the trade of electrician, and has since been working steadily. No record of a mental test in his case.

Case 325. W. twins, Edna Pearl and Edwin. Born in Fairview, Pa., in 1888.—Edna did poorly at school, attained only as far as the sixth grade. There is no record of a mental test, but she is judged to be mentally deficient in the degree of high grade moronism. Her main difficulty has consisted in episodes of excitement which increased in frequency and severity to such an extent that she could no longer be cared for at home. On April 11, 1929, she was committed to the Western Oregon State Hospital at Salem. A diagnosis of mental deficiency with periodic psychotic spells was made. She was tried on parole twice, in 1929, and in 1930, but each time she had to be returned after several months. At the time of our investigation of the case, which was in August, 1931, she was still an inmate there.—Edwin has always been in good health physically and mentally and is well adjusted.

Case 326. R. twins, Louise and John. Born in Santa Clara, Calif., February 10, 1912. Of Polynesian race, parents being native Hawaiians.—Louise did poorly at school, could not get beyond the third grade. By reason of

psychotic episodes characterized by emotional outbursts and aggressive tendencies, she was committed to the Agnew State Hospital, Calif., on January 12, 1928. She remained there only half a month and, as her excitement subsided, was returned to her home. Her spells of excitement continued, however, and on May 26, 1928, she was committed to the Sonoma State Home, Calif. From there, too, she was tried on parole twice, in 1928 and 1930, but each time had to be brought back to the institution, partly by reason of her excited episodes and partly because of a behavior difficulty (soliciting men on the street). At the time of our investigation of the case, which was in February, 1931, she was still an inmate there: "Disturbed a great deal of the time; housed on disturbed ward." A mental test in 1931 revealed I.Q. 59.—John has never caused trouble, was somewhat retarded at school, probably of "dull normal" intelligence. No record of a mental test.

Case 327. S. twins, Earl and Florence. Born in Newmarket, Ont., Canada, October 8, 1888.—Earl had very little schooling, did not advance beyond the second grade. There is no record of a mental test, but he is obviously of subnormal intelligence, estimated as in the degree of moronism. He was a laborer, doing odd jobs. In June, 1916, he enlisted in the army, but proved to be unsatisfactory and was discharged in December, 1916. While in the army he heard voices, but stated that they did not bother him much. Later got a job in a casket factory, lost it after 4 months, but then continued to hang around the plant, would not leave, and the police had to be called. After a brief term in jail, he wandered from one town to another, never could hold a job longer than a few days; finally, on September 9, 1925, he was committed to the Elgin State Hospital, Ill. At the time of our observation of the case, which was in June, 1932, he was still an inmate there. Recent case notes describe him as untidy in appearance, dull, apathetic, smiling to himself; runs and hides when he sees children, saying they are after him. The hospital diagnosis is dementia praecox, hebephrenic type.—Florence has never been in an institution, but is obviously handicapped both intellectually and temperamentally. There is no record of a mental test, but she is judged to be not above the level of "borderline intelligence." She was found living in the basement of an apartment house in a poor section of the city; very slatternly in appearance, coarse and vulgar in her language. Scrubs floors and cleans windows when she can get work, and thus has to support not only herself but also her husband, as he is not working. Complains a great deal and blames everybody she can think of for both her brother's and her own hard luck. Judged to be an inadequate and paranoid personality.

Case 328. H. twins, Catherine and David. Born in Allerton, Mass., February 17, 1910.—The father had a manic-depressive psychosis, manic type, and died in a state hospital. The mother is feeble-minded. An older sister of the twins is epileptic. The home is very poor and dirty.—Both twins were placed in the Wrentham State School, Mass., on February 8, 1921. David, however, was discharged on May 10, 1921, and has since been living with his mother and working in a grocery store. There is no record of a mental test in his case, but he is obviously of subnormal intelligence, judged to be on the "borderline level."—Catherine is more markedly feeble-minded. A mental test in 1931 revealed I.Q. 46. While at the Wrentham State School, she developed psychotic complications which increased in severity to such an extent that it became necessary to transfer her to the Boston State Hospital on May 29, 1931. At the time of our observation of the case, which was in August, 1932, she was still an inmate there. The official diagnosis is mental deficiency with psychosis. Recent case notes state: "During her excited periods she is noisy, has a wild

appearance, shouts and screams and uses profane and obscene language. Strikes anyone near her. Breaks windows and furniture. Afterwards sits staring into space, hair disheveled, immobile. In her disturbed periods it takes several people to restrain her from doing injury to herself and others. Thinks people are talking about her. Stutters, except when excited."

Case 329. F. twins, Sidney and Belle. Born in New York City February 5, 1906. Sidney's case is one of imbecility which has been evident almost from the beginning. It has been attributed either to a cerebral birth trauma sustained in the course of the difficult and instrumental delivery, or to a fall from his baby carriage at the age of 4 months, in which he struck his head on the pavement. He did not walk until 3 years and did not talk until 6. He was sent to school at 10 years and put in an ungraded class, but was taken out after 2 or 3 days, as he was ill-treated by the other children. He was active in a troublesome and mischievous way and difficult to care for at home. He was placed in the Children's Hospital and School at Randall's Island, N. Y., for brief periods at the ages of 12 and 18 years, and finally was committed for permanent care and custody to Letchworth Village at Thiells, N. Y., on May 6, 1927. At the time of our observation of the case, which was in November, 1932, he was still an inmate there. A mental test in 1927 revealed I.Q. 33. A recent case note states: "He goes out with a group of boys from the cottage, but will not do any work except under constant supervision."—Belle developed behavior problems both at home and at school early in adolescence. She would make a disturbance in class, walk out of the room, and return at her convenience. This grew worse, and eventually she became so troublesome that she had to be taken out of school, and for over 2 months she remained in the house continuously, refused to see anyone, would lock herself in her room, and spent most of the time, day and night, reading. Her father then placed her for observation in the Psychopathic Pavilion of Bellevue Hospital, where she stayed for 2 weeks in April, 1924. There she was classified as "a constitutional psychopath with a mania, presumably narcissistic," but was not committed at that time. Immediately upon her release from Bellevue Hospital she disappeared from home and it was soon learned that she had joined a traveling burlesque show and married. She lived with her husband only 3 days, and later her parents had the marriage annulled, partly for the reason that she was a Jewess and her husband a Gentile. In April, 1926, she disappeared again and was located by the police within a few days in "one of the lowest of cabarets." Thereupon she was committed as a "wayward minor" to the Westfield State Farm at Bedford Hills, N. Y., on May 8, 1926. There she apparently settled down, and on March 21, 1927, she was allowed to go home on parole. She obtained a very good position and got along well for several months, but in September, 1927, she disappeared again. It was reported to the parole officer that she had been seen in speakeasies, drinking, wearing expensive clothes, etc., and she was finally located in a night club in Mamaroneck, N. Y. She was then taken back to the Bedford Hills institution on May 2, 1928, seemed again to improve, and on December 14, 1928, was granted once more a parole at home. On February 2, 1929, she was again returned to the institution, as she had violated her parole by running around with a married man, etc. She was then observed to have definitely psychotic symptoms, "talked constantly, showed flight of ideas, walked the floor, and talked in a rambling manner most of the night," and was therefore committed to the state hospital for the criminal insane (Matteawan) at Beacon, N. Y., on June 1, 1929. The observations at the Matteawan State Hospital have been summarized as follows: "On admission here she was restless, overactive, facetious, irritable, appeared to be under considerable pressure of activity and showed flight of ideas. She commented freely on things

seen and heard, denied hallucinations, was approximately oriented, and her memory appeared to be good as far as could be ascertained. Following her admission she continued restless, overactive, noisy, had to be placed in a room by herself, where she sang constantly, frequently pounded on the door, used violent and obscene language, was elated, seemed to be enjoying the situation thoroughly, and showed marked distractibility and flight of ideas. In October, 1929, she was noted as being somewhat quieter, and from that time on she improved steadily. On February 24, 1930, she was discharged as recovered." The hospital diagnosis was manic-depressive psychosis, manic type. Unlike her twin-brother, Belle had good, even somewhat superior intelligence. A Stanford-Binet test in 1928 revealed I.Q. 113.

Group 44. Mental deficiency complicated with child behavior difficulty.—Ten cases have already been presented in which the mental deficiency is complicated not only with epilepsy or psychotic disease, but also with child behavior difficulty: Cases 303, 305, 306, 311, 312, 315, and 323 in Group 42, and Cases 324, 326, and 329 in Group 43.—We present here fifteen additional cases complicated with child behavior difficulty: 330–344.

Case 330. J. twins, David George and Dorothy Ruth. Born in Oakland, Calif., December 20, 1922. Observed by us in one of the Oakland city schools in November, 1931. Mental tests in 1931 revealed, for David, I.Q. 79, for Dorothy, 88.—David presents an annoying behavior problem. His outstanding characteristic seems to be cruelty. Wherever he is, children are crying: he pinches, hits, trips, and sticks pins in them both in and out of school. He is also a coward, and whenever a child turns on him, he runs crying for safety. Always denies his actions, but will repeat the same thing 5 minutes later. It is the same with animals: he has been bitten twice quite badly by dogs which he was abusing. The teacher is keeping him seated in a part of the room away from other children.—Dorothy presents no problem of any kind, except that she and David do not get along well, as she seems to be afraid of him.

Case 331. C. twins, Nellie and Robert. Born in Michigan April 4, 1921. Observed by us in April, 1931, in a private boarding school for orphans in Los Angeles, Calif., where they had been placed following their mother's death, the father being unable to manage them properly.—Mental tests made, respectively, in 1930 and 1929, revealed, for Nellie, I.Q. 77, for Robert, 109.—Nellie has done poorly at school in her studies, has had to repeat both the first and second grades; otherwise she presents no problem.—Robert has done well in his studies, but has presented a behavior difficulty from an early age. Before his mother died he stole constantly, but without penalty, as his mother made good his thefts and kept them from the father's knowledge. Robert is much interested in burglary, reads all he can find about it in the newspapers. Also on one occasion, he tried to set fire to his father's house.

Case 332. G. twins, Gideon and Catherine. Born in Nogales, Ariz., October 25, 1913. Observed by us in April, 1931, in one of the Los Angeles, Calif., city schools. Mental tests in 1930 revealed, for Gideon, I.Q. 77; for Catherine, 95. Gideon presents a double problem: he is very backward in his studies and is "schizoid" in his attitude and behavior. He is described by his mother as "extremely sensitive, very easily downed; he will not show temper, but is quietly resentful toward anyone who hurts his feelings; seldom ever makes up with such a person."—Catherine is doing well in her studies and presents no problem of any kind.

Case 333. S. twins, Edna and Edwin. Born January 5, 1917. Both are of subnormal intelligence. Mental tests in 1928 revealed, for Edna, I.Q. 77; for

Edwin, 83. Both are also retarded at school; at the time of our investigation of the case, which was in May, 1931, Edna was in the fourth grade and Edwin in the fifth. Edwin has presented no other problem, but in Edna's case there has been, in addition, a behavior difficulty, with a suggestion of possibly pre-psychotic traits: she was whipped by her mother and ran away from home in the spring of 1929; upon her return, she suddenly became afraid that her mother was going to whip her again, so she ran away the second time and appealed to the police for protection. She was therefore placed in the Girls' Parental School in Seattle, Wash., on May 1, 1929, and at the time of our investigation (2 years later) was still an inmate there.

Case 334. T. twins, Aurora and Edward. Born in Oakland, Calif., February 13, 1918. Observed by us through the courtesy of the Institute of Child Welfare at Berkeley, Calif., in March, 1932. Their father is serving a sentence in San Quentin Prison, Calif. Both twins are of subnormal intelligence. Mental tests made, respectively, in 1929 and 1930, revealed, for Aurora, I.Q. 77, for Edward, 72. Both are also retarded at school, Aurora by 2 years, and Edward by 3. Edward presents no other problem, but Aurora presents a behavior difficulty consisting of stealing and lying.

Case 335. B. twins, Donald and Dorothea. Born in Detroit, Mich., August 27, 1917.—At the time of our investigation of the case, which was in February, 1931, Dorothea was in the eighth grade in school, making normal progress, fond of her work, of calm and sociable disposition, and presenting no problem of any kind.—Donald, too, got along normally until the age of 8 years, when his troubles began following a head injury. He fell a distance of 2 stories, landing on a concrete pavement, was rendered unconscious and remained so all night, and kept bleeding from his mouth and nose. Upon recovery from the immediate effects of his injury, a great change was noticed in him. He complained of severe frontal headaches, developed a tendency to stutter; at times walked in his sleep, would scream out, and would resist violently all attempts to get him back to bed; the next day he would have no recollection of these episodes. He also became a persistent truant from school and developed a habit of running away from home. He became disobedient, difficult to manage, had temper tantrums and in anger would pound his head on the floor or pavement. Soon, he developed also a tendency to steal money from home. Often he would spend all day in picture shows and would remain out late at night by himself. He was known in the neighborhood as a vicious boy who quarrels and throws stones at other children. Finally, on July 30, 1930, he was committed to the Whittier State School, Calif. At the time of our observation of the case (February, 1931) he was still an inmate there. A mental test in 1930 revealed I.Q. 73. The institution records state: "Although a great deal of time was spent in an effort to get at the underlying reason for the boy's persistent running away, he insisted that he just gets the notion all at once." The boy said: "Feeling rotten, terrible, just sitting down in a chair thinking, then all at once I just go off."

Case 336. G. twins, Floy and Coy. Born in Sweetwater, Okla., January 12, 1914. The mother died when the twins were young and the father is a disabled war veteran, an inmate of the Soldiers' Home at Sawtelle, Calif. The twins have been practically without a home and without supervision.—Floy is of subnormal intelligence; a mental test in 1930 revealed I.Q. 73. Coy's intelligence is normal; a mental test in 1929 revealed I.Q. 93.—Although both have been before Juvenile Court repeatedly, their cases are not classified as juvenile delinquency, as they were referred mainly on account of lack of proper guardianship. They both played hookey from school, and Coy was also a

runaway. Floy was eventually committed to the Sonoma State Home on December 10, 1930, and at the time of our investigation of the case, which was in April, 1931, she was still an inmate there.

Case 337. H. twins, Christina and Kenneth. Born in Dundalk, Ont., Canada, February 21, 1917.—Christina did poorly at school, reached but the sixth grade at 15 years. A mental test in 1932 revealed I.Q. 72. Since the age of 9 years she has had a record of petty thieving, such as taking candy and fruit from stores. She has been expelled from school several times for breaking rules and "incurability." She has also been a persistent sex-delinquent: "takes no interest in anything but boys; has been intimate with a boy with an old court record." In October, 1931, she ran away with another boy and was then committed to the Edith L. Groves School for Delinquent Girls, where she remained until January, 1932. On March 30, 1932, she was committed to the Ontario Hospital at Orillia, Canada. At the time of our observation of the case, which was in August, 1932, she was still an inmate there. At this institution she has been noted as being lazy, stubborn; "refuses to work, says she is sick; has indulged in temper tantrums at night until she had to be put in a restraining sheet."—Kenneth is in the eighth grade now (1932) and reported as satisfactory; has been truant several times, but not enough to get him into trouble. No record of a mental test.

Case 338. R. twins, Leonard and Daisy. Born in Phoenix, Ariz., January 10, 1921. Our observation in May, 1931, in one of the Santa Monica, Calif., city schools.—Leonard was the first-born of the twins and weighed only 3 lbs. Daisy was born 3 hours later and weighed 6 lbs. Daisy started to walk 6 months ahead of Leonard. She has always been a healthy baby, and is even now larger and more robust than Leonard. They both had smallpox at 3 years, Leonard's was a severe case, Daisy's a very mild one. Leonard was a sickly boy during infancy and early childhood. They are also very unequal in intelligence. Mental tests made, respectively, in 1928 and 1929, revealed, for Leonard, I.Q. 72, for Daisy, 89. Daisy has made good progress in studies, is industrious, and presents no behavior difficulty.—Leonard has done poorly at school and is a behavior problem: "Never works if he can get out of it; often causes trouble in the classroom; on the playground is the coward-bully type; torments the smaller boys, but cries on the slightest provocation; is untruthful and quarrelsome."

Case 339. W. twins, Edward and Martha. Born in Crockett, Calif., December 26, 1913. Both are of subnormal intelligence. Mental tests made, respectively in 1931 and 1930, revealed, for Edward, I.Q. 67; for Martha, 59. There are several other children in the family, all of whom are bright and present no behavior problem.—Edward is well behaved, has worked since the age of 9 years after school hours as a helper in a butcher shop.—Martha has never wanted to go to school, used to run away; talked nothing but neologisms up to the age of 4 years, and still has a marked speech impediment. Just before menstrual periods she becomes restless and attempts to leave home. She became quite unmanageable, and on August 10, 1926, she was committed to the Sonoma State Home, Calif. On August 19, 1927, she was granted a parole and almost immediately contracted a gonorrheal infection. She was therefore returned to the institution on October 20, 1927, and was sterilized. Since then she has been given two more trials on parole, but could not get along outside and had to be returned. At the time of our observation of the case, which was in February, 1931, she was still an inmate there.

Case 340. C. twins, Marguerite and Braggie. Negro children, born in Los Angeles, Calif., July 22, 1916. Observed by us in April, 1931, through the

courtesy of the Department of Psychology and Research, Los Angeles city schools. Both are of subnormal intelligence. Mental tests in 1930 revealed, for Marguerite, I.Q. 66, for Braggie, 82. Both are retarded in studies, Marguerite more so than Braggie.—Marguerite has been reported repeatedly for stealing money and clothing at school. Although apprehended in the act and the missing things have been found in her locker, she has denied the charges.—Braggie has presented no behavior difficulty.

Case 341. J. twins, Rosie and James. Born in Portland, Idaho, July 30, 1918. The father deserted the family and they are supported by the county. One sister and one brother are in a detention home as juvenile delinquents. Both twins are of subnormal intelligence. Mental tests made, respectively, in 1932 and 1926, revealed, for Rosie, I.Q. 62, for James, 83. Both have also done poorly in their studies at school. Rosie stayed 3 terms in the low first grade, 3 terms in the high first grade, repeated the third grade, is now rated "D" in all her studies. James repeated the first and third grades, is in the "Z" (slow moving) section and rates "D" in work and effort. Both twins also present behavior difficulty, Rosie more markedly so.—Rosie has had temper tantrums both at home and at school; "she is agreeable only when things go her way." She also has a record of truancy. "She is continually being hurt: arm cut; finger crushed; head bruised; hand cut; knee bruised, etc."—"James also has a temper, is mostly sullen and stubborn; like his twin sister, he is continually being hurt."

Case 342. M. twins, Ruth and Ruben. Born in Compton, Calif., September 30, 1918. Observed by us in February, 1932, in one of the Compton city schools. The mother of these twins is described as "over-religious," tries to discipline them by telling them they won't go to heaven, forbids amusements; and they disobey her surreptitiously. Both twins are of subnormal intelligence. Mental tests in 1931 revealed, for Ruth, I.Q. 60, for Ruben, 53. Both are also doing poorly in their studies at school. Ruth, at 13½ years, is in the low fifth grade; Ruben is in the "opportunity room" struggling with fourth grade work. Ruth cries frequently, but presents no marked behavior problem. Ruben is very troublesome: "has a bad temper, swears on slightest provocation, picks on smaller and younger children, likes to kill animals, used an open knife in a scuffle with another boy, sneaks out in the evening to get a free admission to the movies; troublesome incidents at school are of almost daily occurrence." There are plans under way to commit him to an institution for the feebleminded.

Case 343. R. twins, LeRoy and Anna. Born in Illinois May 11, 1919.—Both parents are said to be of subnormal intelligence, both intemperate; father is said also to be psychotic and epileptic.—Anna has presented no problem of any kind. She has done well at school and was due to enter the eighth grade in the fall of 1932. Her aunt, with whom she had lived for 7 years, spoke highly of her, said she was a fine helper in the house. No record of a mental test.—LeRoy has been abnormal from the start. Was a bedwetter for years; at eleven years was still in the first grade. A mental test in 1932 revealed I.Q. 58. He was also a behavior problem at school; often absent, constantly defiant; teacher said, "No one could accurately describe the terrible behavior of this boy." Finally the school refused to keep him. He was referred to the Lower North Child Guidance Clinic in Chicago which reported in June, 1930: "He continues to run the streets; steals and is becoming increasingly difficult to control." On November 17, 1930, he was committed to the Dixon State Hospital, Ill. At the time of our investigation of the case, which was in July, 1932, he was still an inmate there.

Case 344. C. twins, Allen and Alice. Born in Vermont May 31, 1909.—Allen has presented both mental deficiency and a behavior problem. A mental test in 1927 revealed I.Q. 54. In 1925 "he fell in with evil associates who apparently exploited him in bootlegging, etc. The police took him off the street in Massachusetts and took him to court on charge of hugging girls. He was sent to the Boston Psychopathic Hospital for observation. As he was a legal resident of Vermont, arrangements were made for his placement in the Brandon State School, Vt., on December 28, 1925. On July 20, 1928, he was granted parole for work on a farm. He did well and was discharged on June 16, 1930. At the time of our investigation of the case, which was in August, 1930, he was still working as a farm hand and adjusting satisfactorily.—Alice has shown no evidence of mental deficiency, made normal progress at school, and has presented no behavior problem. No record of a mental test.

Group 45. Mental deficiency complicated with juvenile delinquency. Six cases have already been presented in which the mental deficiency is complicated not only with epilepsy, psychotic disease, or child behavior difficulty, but also with juvenile delinquency: Case 315 in Group 42; Cases 324 and 329 in Group 43; and Cases 335, 337, and 343 in Group 44.—We present here sixteen more cases complicated with juvenile delinquency: 345–360.

Case 345. P. twins, Ruth Olivia and Richard Olanda. Born in San Francisco, Calif., January 29, 1915.—Ruth has always been somewhat shy, "schizoid," also of slightly subnormal intelligence; mental test in 1929 revealed I.Q. 79. She became a sex delinquent before her fourteenth birthday, going out with sailors, strangers met on the street, etc. In August, 1929, she disappeared from home, and it appeared later that she had been picked up by a couple of strangers who took her to their room, gave her liquor, and had sexual intercourse with her. In February, 1930, she again disappeared from home, having been picked up by a sailor. She was then committed to the Ventura School for Girls, Calif., on February 21, 1930. At the time of our investigation of the case, which was in December, 1930, she was still an inmate there. At the institution she has been coöperative, an honor girl, described as somewhat shut-in and self-conscious.—Richard is of normal intelligence, is in the second year of high school, is partly earning his way, has presented no problem of behavior.

Case 346. H. twins, Stanley and Phyllis. Born in Todmorden, Ont., Canada, March 8, 1918.—The mother is obviously feeble-minded, the home is dirty. Both twins have enuresis.—Stanley has had to repeat several grades at school; a mental test in 1927 revealed I.Q. 79. He also stammers badly. Since the age of 12 years he has become a sex delinquent and was eventually expelled from school for initiating another boy into homosexual practices. Finally, on January 2, 1931, he was committed to the Reform School at Beamsville, Ont. At the time of our investigation of the case, which was in August, 1932, he was still an inmate there.—Phyllis is somewhat more intelligent; a mental test in 1927 revealed I.Q. 87; has done better in her studies at school; is said to have had chorea and is a bed wetter; otherwise she has presented no problem of any sort.

Case 347. K. twins, Pauline and Paul. Negroes, born in Los Angeles, Calif., August 30, 1914.—Pauline is described as of sullen, unfriendly temperament, emotionally unstable, unreasonable, with general persecutory trend. She is also of subnormal intelligence; a mental test in 1932 revealed I.Q. 78. She has been running around with married men, and on June 3, 1932, she was placed in Juvenile Hall, Los Angeles, as a sex delinquent. She was then found to be 3 months pregnant. After a couple of months there, she was dismissed

as she was approaching the age limit of juvenile court jurisdiction (18 years).—There is no record of a mental test in Paul's case, but he did very well at school, both in scholarship and in behavior, and, at the time of our observation of the case, which was in September, 1932, he had worked for the same employer for 2 years and was highly recommended.

Case 348. E. twins, Alberta and Albert. Born in Toronto, Canada, February 21, 1917.—Alberta has a poor school record, was twice expelled "for incorrigibility and bad influence on other girls"; she is also of subnormal intelligence; a mental test in 1929 revealed I.Q. 78. She has been a sex delinquent almost from childhood. On January 12, 1931, she was placed in the House of Industry, Toronto, and was discharged on January 11, 1932. She got into various troubles again almost immediately, and on July 6, 1932, was committed to the Alexandria Reform School for Girls, Toronto. At the time of our observation of the case, which was in August, 1932, she was still an inmate there. Upon admission there, she was found to be infected with both gonorrhea and syphilis. She is very flippant and blasé, has loud manner, not ashamed of her sexual promiscuity, says all girls do the same, only some are more secretive; has scorn for girls without sexual experience; not interested in working; aggressive and headstrong.—Albert is less troublesome; but he, too, is both feebleminded and delinquent. A mental test in 1929 revealed I.Q. 66. On July 6, 1931, he was brought into juvenile court for stealing a purse out of a car. Because of bad home background he was committed to the Ontario Hospital at Orillia. At the time of our observation of the case, which was in August, 1932, he was still an inmate there.

Case 349. H. twins, William Thomas and May. Born in Spokane, Wash., April 25, 1913.—William was before the Juvenile Court at the age of 14 years for burglary and at 16 years for "delinquency," unspecified. Released to parents each time. In the summer of 1930 he was again arrested on a charge of assault in second degree, and on July 2, 1930, he was sent to the Washington State Reformatory at Monroe, Wash. At the time of our investigation of the case, which was in May, 1931, he was still an inmate there. His own account of the offense is as follows: "A girl about 10 years of age came to our house selling papers. I met her at the door and asked her in the house. I asked her to take off her pants, but she would not, so I started to take them off. She began crying, so I stopped and let her go. She went home and told her parents. I was arrested." He was sentenced to the reformatory for 1 to 10 years. A mental test in 1930 revealed I.Q. 78.—May has never presented any problem. She is doing well as a stenographer in Princeton, B. C., Canada. No record of a mental test in her case.

Case 350. McN. twins, Jane and John. Born in Cobalt, Ontario, Canada, September 6, 1916. Home conditions are said to be unsatisfactory.—Jane has been running the streets and has been known to the juvenile court as a sex delinquent since the age of 13 years. On April 21, 1931, she was committed to the House of Industry, Toronto, because of "lewd and licentious behavior." At the time of our observation of the case, which was in August, 1932, she was still an inmate there. A mental test in 1930 revealed I.Q. 76.—John is somewhat more intelligent; mental test in 1927 revealed I.Q. 87. But he, too, has been troublesome on account of delinquency. At school he was a behavior problem and a truant. In April, 1930, he, together with another boy, broke into and robbed a grocery store of both money and goods. On May 16, 1930, he was committed to the House of Industry, Toronto. At the time of our observation of the case (August, 1932) he was still an inmate there.

Case 351. D. twins, Michael and Mary. Born in Pennsylvania, March 2, 1916.—Parents separated in 1917. Father was a heavy drinker and brutal to the family. Mother negligent, wasteful, probably feeble-minded.—Michael is of subnormal intelligence; a mental test in 1931 revealed I.Q. 76. He was first brought into juvenile court at the age of 13 years for destroying property, and in October, 1929, was placed in the Cleveland Farm School, Ohio, where he remained until October, 1930. Since then he has been before juvenile court on 4 occasions for stealing, destructiveness, and with a bad record of truancy. Finally, on May 22, 1931, he was committed to the Boys' Industrial School at Lancaster, Ohio. At the time of our investigation of the case, which was in July, 1932, he was still an inmate there.—There is no record of a mental test in Mary's case, and we have had no opportunity of observing her. In Michael's social history it is stated that in 1929 Mary was placed in the Blossom Hill Home for Girls, Ohio (a private Catholic home for delinquent girls), as an "incorrigible." She was later removed to some convent, but where and why could not be ascertained.

Case 352. P. twins, Harry and Rose. Born in Stockton, Calif., January 12, 1912. Both are of somewhat subnormal intelligence and both are mildly delinquent. Harry has been a persistent truant from school and was picked up by truant officers several times. In December, 1928, he and 2 other boys had been given several drinks of wine by the father of one of the boys. Then the 3 boys climbed over the fence of an automobile wrecking company and were helping themselves to automobile parts when they were discovered and arrested. On April 30, 1929, Harry was committed to the Preston School of Industry at Ione, Calif. A mental test in 1929 revealed I.Q. 74. He remained in that institution until June 14, 1930, when he was granted a parole. At the time of our observation of the case, which was in April, 1931, he was still on parole getting along fairly well, working at odd jobs.—Rose is somewhat more intelligent; a mental test in 1926 revealed I.Q. 84. She, too, would not go to school, lied about her age, and, on May 13, 1926, was committed to the Ventura School for Girls, Calif., because she had "no parents or guardian capable of exercising proper parental control." The institution record states that she "lacks moral sense and has not had sufficient discipline." However, she was released by court order on August 1, 1926.

Case 353. B. twins, Melbourne and Melba. Born in California, November 15, 1913. Both were retarded at school and both are of subnormal intelligence. Mental tests made, respectively, in 1929 and 1926 revealed, for Melbourne, I.Q. 74, for Melba, 66. Only Melbourne has a record of delinquency, and this consisted of a single episode of sexual relations with a 10 year old girl (statutory rape) when he was 15 years of age. For this he was brought before the Juvenile Court in Los Angeles on April 11, 1929, and released on probation on April 22, 1929. At the time of our observation of the case, which was in July, 1931, the twins were living at home and causing no trouble. Melbourne was working as an auto mechanic's helper and Melba was helping her mother in the house work.

Case 354. F. twins, Catherine and Lawrence. Born in Harrisburg, Pa., December 18, 1915.—Mother described as erratic, garrulous, inadequate, probably of subnormal intelligence; constantly demands to be relieved of the burden of taking care of the twins as she is unable to manage them. An older brother (or half-brother) of the twins, born out of wedlock, was at one time in a reform school in Pennsylvania. The home is filthy, "an impossible place for the children."—Catherine did poorly at school; reached but the sixth grade at 17 years. A mental test in 1932 revealed I.Q. 72. She was expelled from

school in Chattanooga, Tenn., for stealing a watch. Later, in Los Angeles, Calif., she stole a purse at school in 1931 and was placed in the Rowan Welfare School (a special school for problem children). In October, 1932, the mother filed a complaint against Catherine and brought her before the Juvenile Court for disobedience, staying out nights, irregular school attendance, attempting sexual intercourse with her 9 year old brother, etc. Catherine was eventually referred to the Catholic Welfare Bureau for placement in a foster home.—Lawrence has also been in trouble. A mental test in his case, too, revealed I.Q. 72. In February, 1933, at the time of our investigation of the case, he was under arrest on a charge of burglary.

Case 355. T. twins, Lena and Jake. Born in St. Joseph, Mo., November 22, 1915.—At the time of our observation of the case, which was in October, 1932, Lena was in an ungraded room in the Norfolk Development School, Los Angeles. I.Q. 70. She is quiet, docile, causes no trouble, good helper at home.—Jake is more intelligent; a mental test in 1929 revealed I.Q. 87. He is emotionally unstable, cries readily, has violent temper outbursts. His delinquency episode occurred in October, 1930, when he and another boy forced a 2½ year old little boy to use his mouth on their genitals. After 2 weeks in Juvenile Hall, Los Angeles, he was granted probation.

Case 356. B. twins, Luis and Juana. Part-Indian. Born in Mexico June 21, 1915.—Juana is a normal girl, rather attractive, helps in homes and care of babies, has never been in difficulty.—Luis is of subnormal intelligence; mental test in 1932 revealed I.Q. 65. He has been before Juvenile Court in Los Angeles, Calif., on 3 occasions, twice in 1930 and once in 1932, respectively, for "malicious destruction" (of railway switch lights), stealing from a warehouse, and stabbing another boy in a fight 3 times, necessitating treatment in the Receiving Hospital. At the time of our investigation of the case, which was in September, 1932, he was at home on probation: disagreeable, rather ill-tempered, undersized, smaller than his twin-sister.

Case 357. B. twins, Dorida and Edward. Born in Canada, May 15, 1909. The maternal grandfather was sentenced to the Massachusetts State Prison in 1922 for incestuous relations with his granddaughter (Dorida); he gave her a venereal infection. The mother is of subnormal intelligence and has a police record for fornication. The father also served a term in Norfolk jail for sexual offenses. He, too, committed incest with Dorida and caused her first illegitimate pregnancy.—Dorida was first arrested on July 29, 1925, as a wayward child and sent to the House of the Good Shepherd for one year. On October 8, 1931, she was convicted of fornication and sentenced to the Reformatory for Women at Framingham, Mass. At the time of our investigation of the case, which was in August, 1932, she was still an inmate there. She has 3 illegitimate children; is not sure who the fathers are, as she has been with as many as 12 men in one night. Her first child showed evidences of venereal infection since early infancy with eyes, ears, nose, and fingers discharging pus. A mental test in 1931 revealed I.Q. 65.—Edward has presented a problem of alcoholism since his adolescence. He has a record of 5 arrests for drunkenness from 1925 to 1928 with probation, fines, and imprisonments in the House of Correction, Massachusetts. He married, but failed to support his family, and on June 5, 1930, was arrested for non-support of family; was placed on probation and ordered to pay \$2 weekly. No record of a mental test in his case.

Case 358. L. twins, Abel and Esther. Born in Santa Barbara, Calif., October 15, 1914.—Both twins are of subnormal intelligence. In Abel's case a mental test in 1930 revealed I.Q. 64. In Esther's case there is no record of a

mental test; she was in the seventh grade at 16 years, and on the basis of her educational achievement, her I.Q. is estimated at about 80. However, she has otherwise presented no problem.—Abel did very poorly at school, soon began to dislike school, and has many times asked his parents to allow him to quit school. At the age of 12 years he fell in with bad companions, leaving home repeatedly. In 1927 he, in company with another boy who had had a reform school record, stole an automobile, but the charge was not pressed at that time. He continued to run around with bad companions, and in May, 1929, he and two other boys burglarized a storehouse in Ojai, Calif. Abel was then given another chance. In November, 1929, he ran away again, went to San Pedro, Calif., intending to enlist in the navy. He was brought back, and on November 29, 1929, was committed to the Whittier State School, Calif. At the time of our investigation of the case, which was in January, 1931, he was still an inmate there, getting along quite satisfactorily and adjusting well to the institutional environment.

Case 359. V. twins, Florence and James. Born in Kamloops, B. C., Canada, November 6, 1914.—Both twins are of subnormal intelligence, but Florence much more markedly so. Mental tests made respectively in 1930 and in 1926 revealed, for Florence, I.Q. 58, for James, 81.—Florence has been in addition a sex delinquent. She stayed out nights, her father gave her a beating, later brought her before the Juvenile Court in 1928. She spent much time in the Hindu district in New Westminster, B. C., and was said to be intimate with Hindus and Chinese. She was tried on probation, but there was no improvement, and on July 27, 1929, she was committed to the Girls' Industrial School at Vancouver. At the time of our investigation of the case, which was in May, 1931, she was still an inmate there.—James did rather poorly at school, reached but the seventh grade, but otherwise has presented no problem.

Case 360. S. twins, Joe and Cecilia. Born in Missouri, September 19, 1917.—The twins come of a good home, and were the first-born of 5 children. Only Joe has been a problem, his twin-sister Cecelia and the 3 younger children being normal in intelligence and in behavior and having done well at school.—Joe is of subnormal intelligence; a mental test in 1931 revealed I.Q. 57. He did very poorly at school, soon became a persistent truant, and was first brought into Juvenile Court at the age of 12 years for that reason. Since then, he has been in court 3 more times for stealing fruit and candy. Said he wanted to be put in jail, thought it would be fun to ride in the police patrol. In the summer of 1931 he broke into a box car, then ran away from home (in Ohio), got as far as Buffalo, N. Y., was apprehended, returned to Ohio, and on September 18, 1931, was committed to the Boys Industrial School at Lancaster, Ohio. At the time of our observation of the case, which was in July, 1932, he was still an inmate there. His record at the institution has been unsatisfactory: has tried to escape; stole sweet potatoes from the kitchen and ate them raw; stole table silver and hid it in his room; uses vile language; was found indulging in homosexual practices with another boy; stole things from one boy, hid them in another boy's desk, then tried to throw the blame on the other boy.

Group 46. Mental deficiency complicated with adult criminality. Three cases have already been presented in which the mental deficiency is complicated not only with psychotic disease or juvenile delinquency, but also with adult criminality: Cases 324 and 329 in Group 43, and Case 357 in Group 45. We present here six additional cases complicated with adult criminality: 361-366.

Case 361. L. twins, William Chester and Jeanette. Born in Santa Cruz, Calif., October 29, 1907. The mother is psychotic, in the Stockton State

Hospital, Calif.—William was first placed in the Sonoma State Home, Eldridge, Calif., because he had done poorly at school and was found to be feeble-minded, in the fall of 1927. He was paroled, after some training, and did fairly well for a time as an automobile mechanic's helper. In the summer of 1930 he was convicted of forgery (checks), but, on account of his previous adjudication as feeble-minded, was not sentenced to prison, but re-committed to the Sonoma State Home on June 14, 1930. At the time of our observation of the case, which was in February, 1931, he was still an inmate there. A mental test in 1930 revealed I.Q. 76.—Jeanette is of normal intelligence, has presented no problem, reached the fourth year in high school and left on account of having to have a tonsillectomy. Later married, now has 2 normal children, is well adjusted. No record of a mental test in her case.

Case 362. C. twins, Leona and Leo. Born in Canada, December 26, 1903. The mother died in childbirth at the time the twins were born. The twins were adopted in separate homes.—Leona did poorly at school, reached but the seventh grade at 17 years, when she had to leave and go to work, as her foster parents had lost all their money. She worked as a domestic. On May 30, 1931, she was arrested on a technical charge of vagrancy preferred by her father. For a year and a half she had been living with a Negro; the neighbors complained of their drinking parties late at night. Leona was found to be infected with syphilis. She was committed to the Home of the Good Shepherd at Toronto, Canada, on June 11, 1931. At the time of our investigation of the case, which was in August, 1932, she was still an inmate there. A mental test in 1931 revealed I.Q. 75.—Leo had a high school education, then worked as a telegraph lineman; was highly thought of and has never presented any behavior problem. He was killed accidentally by a contact with a live wire while at his work at the age of 24 years. No record of a mental test in his case.

Case 363. McE. twins, Hubert R. and Della. Born in Yoevil, Ont., Canada, September 22, 1907. History very meager. Hubert R. worked as a farm hand and had no prior criminal record. On March 14, 1931, he was sentenced to the Washington State Reformatory at Monroe, Wash., for a term of 6 months to 15 years for second degree burglary. At the time of our investigation of the case, which was in May, 1931, he was still an inmate there. His account of the offense is as follows: "I entered a building and stole steel drills, Hammons saw, etc. I sold the tools for \$7.50. I also stole a camera out of a house where we were rooming. I sold the camera for 50 cents." A mental test in 1931 revealed I.Q. 73.—Della is normal, married, lives at Holstein, Ont., Canada. No record of a mental test in her case.

Case 364. R. twins, Mack and Susie. Negroes. Born in Jacksonville, Fla., February 25, 1900. Mother died in an insane hospital.—Mack did poorly at school, reached but the third grade at the age of 12 years, when he left. Also has a poor work record. He has a long criminal record and has used at least one alias. In February, 1922, he was sentenced to the State Farm at Raiford, Fla., for 4 years for grand larceny, but escaped from there. In 1926 he was sentenced for larceny to the U. S. Penitentiary at Atlanta, Ga., for 4 years. On November 22, 1930, he was sentenced, for breaking and entering, to the Western Penitentiary at Pittsburgh, Pa., for from 10 to 20 years. At the time of our investigation of the case, which was in July, 1932, he was still an inmate there. He stated that he had broken into 2 adjoining jewelry stores in Wilkinsburg, Pa., by breaking the windows; stole jewelry valued at about \$1,000; sold some of it and pawned the rest. Theft was traced through pawn shop, he pleaded guilty. A mental test in 1930 revealed I.Q. 70.—Susie attended school, leaving at 18, then worked as seamstress, later married and is a house-

wife. Has never been in serious difficulty. No record of a mental test in her case.

Case 365. B. twins, Joseph and Mary. Negroes. Born in Lafayette, La., March 1, 1899. Father and 5 brothers are laborers on a farm; mother died at 29 in childbirth.—Mary is normal, has been a school teacher, is now married and has never been in any serious difficulty. No record of a mental test in her case.—Joseph is the only troublesome member of the family. He has a long criminal record: one year in U. S. Disciplinary Barracks at Ft. Leavenworth, Kan., for larceny; many arrests and jail sentences for minor offenses such as drunkenness, disorderly conduct, petty larceny, etc., in Youngstown, Ohio, Buffalo, N. Y., and towns in Pennsylvania, for terms of from 30 days to 6 months. He had done poorly at school, reached fifth grade, but educational achievement was scarcely above the second grade. A mental test in 1930 revealed I.Q. 62. Very poor work record. Described as "a typical Negro floater, addicted to drinking, gambling, and the pursuit of women." On April 12, 1930, he was sentenced to the Western Penitentiary at Pittsburgh, Pa., for 2 to 5 years for robbery of \$28 from a candy store, although he claims to have won the money in a crap game. At the time of our investigation of the case, which was in July, 1932, he was still an inmate there.

Case 366. F. twins, Carmela and Filomena. Born in Italy April 26, 1891. Carmela was committed to the State Institution for Male Defective Delinquents at Napanoch, N. Y., on May 27, 1932. At the time of our investigation of the case, which was in November, 1932, he was still an inmate there. He had cut another Italian with a knife in a fight which grew out of an argument about the war. No previous criminal record. He is illiterate and of subnormal intelligence. A mental test in 1932 revealed I.Q. 47.—Filomena is in Italy, married, has never been in any trouble; no record of a mental test.

Summary of Findings in Opposite-Sex Twins.

We have presented 139 pairs of opposite-sex twins with mental deficiency in one or both of each pair.

The distribution of intelligence quotients among the 278 individuals is as shown in Table XII.

TABLE XII
DISTRIBUTION OF INTELLIGENCE QUOTIENTS IN OPPOSITE-SEX TWINS

	Males	Females	Total
I.Q. under 20.....	3	—	3
20-29.....	4	1	5
30-39.....	4	2	6
40-49.....	9	6	15
50-59.....	7	9	16
60-69.....	20	13	33
70-79.....	45	33	78
80-84.....	9	9	18
85 or over.....	12	25	37
Mentally deficient, I.Q. unascertained.....	10	14	24
Normal intelligence, I.Q. unascertained.....	16	27	43
Total.....	139	139	278

The differences in I.Q. between the twins in the pairs vary as shown in Table XIII.

TABLE XIII
DIFFERENCES IN POINTS OF I.Q. BETWEEN TWINS IN OPPOSITE-SEX PAIRS

	Points of Difference in I.Q.						Total
	0-5	6-10	11-15	16-20	21-25	Over 25	
Number of ascertained cases..	17	21	14	13	8	43	116
Per cent of ascertained cases..	14.6	18.1	12.1	11.2	6.9	37.1	100

In Table XIV the cases contained in our group of opposite-sex twins are classified according to complicating conditions presented by them. This table is comparable with Tables IV and IX in § 3 and § 4, respectively, in which corresponding data are furnished for our groups of monozygotic and same-sex dizygotic twins. Here again the total figures exceed the number of individuals represented, as some cases are counted more than once on account of presenting 2 or more complications.

TABLE XIV
OPPOSITE-SEX TWINS CLASSIFIED ACCORDING TO EXISTING COMPLICATIONS

	Males	Females	Totals
Uncomplicated mental deficiency.....	67	52	119
Mental deficiency complicated with paralysis	2	5	7
“ “ “ “ epilepsy	17	12	29
“ “ “ “ psychotic disease... .	4	8	12
“ “ “ “ behavior difficulty... .	12	14	26
“ “ “ “ juvenile delinquency	14	11	25
“ “ “ “ adult criminality... .	5	4	9
Normal intelligence (I.Q. 85 or over) with complications	4	3	7
“ “ “ “ “ without “	24	49	73
Totals	149	158	307

As has already been shown in connection with our monozygotic and same-sex dizygotic groups of twins in Tables V and X, § 3 and § 4, respectively, the degree of concordance in intelligence presents marked contrasts as between cases of uncomplicated mental deficiency, on the one hand, and cases in which one or both of the twins in each pair present a complication in the form of infantile palsy, epilepsy, etc. The corresponding data for

opposite-sex twins are given in Table XV, to facilitate further comparisons.

TABLE XV
DEGREES OF CONCORDANCE IN I.Q. IN CASES WITH AND WITHOUT
COMPLICATIONS IN OPPOSITE-SEX TWINS

	Uncomplicated Cases	Cases with Complications
Both affected, similarly	22.1%	3.5%
Both affected, dissimilarly	29.4%	21.1%
One affected	48.5%	75.4%

In Table XVI we present the distribution of conditions complicating the mental deficiency in our opposite-sex twin-pairs. The data in this Table have been compiled and arranged in the same manner as those presented in Tables VI and XI, § 3 and § 4, which furnish corresponding data for our monozygotic and same-sex dizygotic groups.

TABLE XVI
DISTRIBUTION OF THE COMPLICATIONS IN THE OPPOSITE-SEX TWIN-PAIRS
The Other Twins

	Propositi	Uncomplic. Mental Deficiency	Infantile Palsies	Epilepsy	Psychotic Disease	Behavior Difficulties	Juvenile Delinquency	Adult Criminality	Normal Individuals	Totals
Uncomplicated Mental Deficiency	119	70	1	4	3	6	4	—	33	121
Infantile Palsies	7	1	—	1	—	—	—	—	5	7
Epilepsy	29	4	1	6	1	3	1	—	16	32
Psychotic Disease	12	3	—	1	—	1	—	—	7	12
Behavior Difficulties	27	6	—	3	1	6	1	1	12	30
Juvenile Delinquency	30	4	—	1	—	1	12	2	12	32
Adult Criminality	10	—	—	—	—	1	2	2	7	12
Normal Individuals	73	33	5	16	7	12	12	7	—	92
Total	307	121	7	32	12	30	32	12	92	338

Among the opposite-sex twins neither mental deficiency nor, on the whole, the various complicating conditions are found to be equally distributed in the two sexes. This is clearly shown in Table XVII. It will be seen that both mental deficiency and

its complicating conditions are more common in the male sex. Of a total of 139 subjects in each sex group, only 24 males were normal, as compared with 49 females. In other words 115 males and only 90 females were affected by mental deficiency, or one or more of its complications, or both: an excess of males amounting to 27.8 per cent.

TABLE XVII

DISTRIBUTION OF MENTAL DEFICIENCY AND VARIOUS COMPLICATING CONDITIONS
IN TWO SEXES IN OPPOSITE-SEX TWINS

	Males	Females
Mental deficiency (I.Q. under 85).....	111	87
Infantile Palsies	2	5
Epilepsy.	17	11
Psychotic Disease	4	9
Behavior Difficulty	14	14
Juvenile Delinquency	17	12
Adult Criminality	6	4
Normal Individuals	24	49

§ 6. *Sex Factors in Intelligence.*

The somewhat greater frequency of mental deficiency in the male than in the female sex has been repeatedly noted by students of the subject. Perhaps the most conclusive evidence of this fact is contained in the data revealed by opposite-sex twins. Thus, in our group of such twins,—139 pairs,—selected on the basis of the existence of mental deficiency, in one or both of the twins in each pair, we find, as shown in Table XVII in the preceding section, that 111 males and 87 females showed mental deficiency: a relative excess of males amounting to 27.6 per cent.

The conclusion is hardly to be evaded, that sex is an etiologic factor in mental deficiency.

In this connection, attention may be called to the rather consistent finding of a slightly better showing in tests of general intelligence made by girls than by boys. In harmony with this finding is the somewhat better scholastic record among girls than among boys, as reported by teachers.

All this suggests the possibility that gene factors of intelligence may in some cases be contained in the X-chromosomes, although for the most part, undoubtedly, they are carried in the autosomes.

If this is true, then the formulas usually employed to show the hereditary transmission of mental deficiency in the manner of a recessive trait in Mendelism are no longer adequate. The matter at once acquires a much greater complexity.

The various theoretical possibilities are indicated, not in six formulas, but in 54. The symbols, D and R, for each individual represented in such formulas may now appear in two rows, the upper row to represent the genes contained in the autosomes and the lower row those in the X-chromosomes. Male subjects will have but one symbol in the lower row, to correspond with the single X-chromosome; and female subjects will have two, to correspond with the two X-chromosomes.

Instead of all individuals being theoretically classifiable—as with respect to a simple allelomorphic pair of traits—into DD, DR, and RR, we now would have no fewer than six possible types of male subjects and nine possible types of female subjects, as follows:

Male subjects: $\begin{matrix} DD, & DD, & DR, & DR, & RR, & RR. \\ D & R & D & R & D & R \end{matrix}$

Female subjects: $\begin{matrix} DD, & DD, & DD, & DR, & DR, & DR, & RR, & RR, & RR. \\ DD & DR & RR & DD & DR & RR & DD & DR & RR \end{matrix}$

It is not suggested here that the theoretical possibilities represented in the above symbols exhaustively represent the distribution of gene factors of human intelligence. Such factors may be carried in many or all of the chromosomes, and there may be more than one in each chromosome; there may be, moreover, qualitative differences between gene factors of intelligence. Such assumptions alone are capable of accounting for the great individual differences in intelligence, qualitative and quantitative. The above classification is offered merely as the simplest one in which provision is made for the possible existence of a sex-linked factor of intelligence; and it is offered for the help that may be derived from it in the interpretation of some parts of the observed material.

The 54 possible types of mating, together with the theoretical expectation of offspring, are represented in the following formulas:

1. $\frac{DD}{D} \times \frac{DD}{DD} = \frac{DD}{D} + \frac{DD}{DD}$
2. $\frac{DD}{D} \times \frac{DD}{DR} = \frac{DD}{D} + \frac{DD}{R} + \frac{DD}{DD} + \frac{DD}{DR}$
3. $\frac{DD}{D} \times \frac{DD}{RR} = \frac{DD}{R} + \frac{DD}{DR}$
4. $\frac{DD}{D} \times \frac{DR}{DD} = \frac{DD}{D} + \frac{DR}{D} + \frac{DD}{DD} + \frac{DR}{DD}$
5. $\frac{DD}{D} \times \frac{DR}{DR} = \frac{DD}{D} + \frac{DD}{R} + \frac{DR}{D} + \frac{DR}{R} + \frac{DD}{DD} + \frac{DD}{DR} + \frac{DR}{DD} + \frac{DR}{DR}$
6. $\frac{DD}{D} \times \frac{DR}{RR} = \frac{DD}{R} + \frac{DR}{R} + \frac{DD}{DR} + \frac{DR}{DR}$
7. $\frac{DD}{D} \times \frac{RR}{DD} = \frac{DR}{D} + \frac{DR}{DD}$
8. $\frac{DD}{D} \times \frac{RR}{DR} = \frac{DR}{D} + \frac{DR}{R} + \frac{DR}{DD} + \frac{DR}{DR}$
9. $\frac{DD}{D} \times \frac{RR}{RR} = \frac{DR}{R} + \frac{DR}{DR}$
10. $\frac{DD}{R} \times \frac{DD}{DD} = \frac{DD}{D} + \frac{DD}{DR}$
11. $\frac{DD}{R} \times \frac{DD}{DR} = \frac{DD}{D} + \frac{DD}{R} + \frac{DD}{DR} + \frac{DD}{RR}$
12. $\frac{DD}{R} \times \frac{DD}{RR} = \frac{DD}{R} + \frac{DD}{RR}$
13. $\frac{DD}{R} \times \frac{DR}{DD} = \frac{DD}{D} + \frac{DR}{D} + \frac{DD}{DR} + \frac{DR}{DR}$
14. $\frac{DD}{R} \times \frac{DR}{DR} = \frac{DD}{D} + \frac{DD}{R} + \frac{DR}{D} + \frac{DR}{R} + \frac{DD}{DR} + \frac{DD}{RR} + \frac{DR}{DR} + \frac{DR}{RR}$
15. $\frac{DD}{R} \times \frac{DR}{RR} = \frac{DD}{R} + \frac{DR}{R} + \frac{DD}{RR} + \frac{DR}{RR}$
16. $\frac{DD}{R} \times \frac{RR}{DD} = \frac{DR}{D} + \frac{DR}{DR}$
17. $\frac{DD}{R} \times \frac{RR}{DR} = \frac{DR}{D} + \frac{DR}{R} + \frac{DR}{DR} + \frac{DR}{RR}$
18. $\frac{DD}{R} \times \frac{RR}{RR} = \frac{DR}{R} + \frac{DR}{RR}$
19. $\frac{DR}{D} \times \frac{DD}{DD} = \frac{DD}{D} + \frac{DR}{D} + \frac{DD}{DD} + \frac{DR}{DD}$
20. $\frac{DR}{D} \times \frac{DD}{DR} = \frac{DD}{D} + \frac{DD}{R} + \frac{DR}{D} + \frac{DR}{R} + \frac{DD}{DD} + \frac{DD}{DR} + \frac{DR}{DD} + \frac{DR}{DR}$

21. $\frac{DR}{D} \times \frac{DD}{RR} = \frac{DD}{R} + \frac{DR}{R} + \frac{DD}{DR} + \frac{DR}{DR}$
22. $\frac{DR}{D} \times \frac{DR}{DD} = \frac{DD}{D} + 2\frac{DR}{D} + \frac{RR}{D} + \frac{DD}{DD} + 2\frac{DR}{DD} + \frac{RR}{DD}$
23. $\frac{DR}{D} \times \frac{DR}{DR} = \frac{DD}{D} + \frac{DD}{R} + 2\frac{DR}{D} + 2\frac{DR}{R} + \frac{RR}{D} + \frac{RR}{R} + \frac{DD}{DD} + \frac{DD}{DR}$
 $+ 2\frac{DR}{DD} + 2\frac{DR}{DR} + \frac{RR}{DD} + \frac{RR}{DR}$
24. $\frac{DR}{D} \times \frac{DR}{RR} = \frac{DD}{R} + 2\frac{DR}{R} + \frac{RR}{R} + \frac{DD}{DR} + 2\frac{DR}{DR} + \frac{RR}{DR}$
25. $\frac{DR}{D} \times \frac{RR}{DD} = \frac{DR}{D} + \frac{RR}{D} + \frac{DR}{DD} + \frac{RR}{DD}$
26. $\frac{DR}{D} \times \frac{RR}{DR} = \frac{DR}{D} + \frac{DR}{R} + \frac{RR}{D} + \frac{RR}{R} + \frac{DR}{DD} + \frac{DR}{DR} + \frac{RR}{DD} + \frac{RR}{DR}$
27. $\frac{DR}{D} \times \frac{RR}{RR} = \frac{DR}{R} + \frac{RR}{R} + \frac{DR}{DR} + \frac{RR}{DR}$
28. $\frac{DR}{R} \times \frac{DD}{DD} = \frac{DD}{D} + \frac{DR}{D} + \frac{DD}{DR} + \frac{DR}{DR}$
29. $\frac{DR}{R} \times \frac{DD}{DR} = \frac{DD}{D} + \frac{DD}{R} + \frac{DR}{D} + \frac{DR}{R} + \frac{DD}{DR} + \frac{DD}{RR} + \frac{DR}{DR} + \frac{DR}{RR}$
30. $\frac{DR}{R} \times \frac{DD}{RR} = \frac{DD}{R} + \frac{DR}{R} + \frac{DD}{RR} + \frac{DR}{RR}$
31. $\frac{DR}{R} \times \frac{DR}{DD} = \frac{DD}{D} + 2\frac{DR}{D} + \frac{RR}{D} + \frac{DD}{DR} + 2\frac{DR}{DR} + \frac{RR}{DR}$
32. $\frac{DR}{R} \times \frac{DR}{DR} = \frac{DD}{D} + \frac{DD}{R} + 2\frac{DR}{D} + 2\frac{DR}{R} + \frac{RR}{D} + \frac{RR}{R} + \frac{DD}{DR} + \frac{DD}{RR}$
 $+ 2\frac{DR}{DR} + 2\frac{DR}{RR} + \frac{RR}{DR} + \frac{RR}{RR}$
33. $\frac{DR}{R} \times \frac{DR}{RR} = \frac{DD}{R} + 2\frac{DR}{R} + \frac{RR}{R} + \frac{DD}{RR} + 2\frac{DR}{RR} + \frac{RR}{RR}$
34. $\frac{DR}{R} \times \frac{RR}{DD} = \frac{DR}{D} + \frac{RR}{D} + \frac{DR}{DR} + \frac{RR}{DR}$
35. $\frac{DR}{R} \times \frac{RR}{DR} = \frac{DR}{D} + \frac{DR}{R} + \frac{RR}{D} + \frac{RR}{R} + \frac{DR}{DR} + \frac{DR}{RR} + \frac{RR}{DR} + \frac{RR}{RR}$
36. $\frac{DR}{R} \times \frac{RR}{RR} = \frac{DR}{R} + \frac{RR}{R} + \frac{DR}{RR} + \frac{RR}{RR}$
37. $\frac{RR}{D} \times \frac{DD}{DD} = \frac{DR}{D} + \frac{DR}{DD}$
38. $\frac{RR}{D} \times \frac{DD}{DR} = \frac{DR}{D} + \frac{DR}{R} + \frac{DD}{DD} + \frac{DR}{DR}$
39. $\frac{RR}{D} \times \frac{DD}{RR} = \frac{DR}{R} + \frac{DR}{DR}$
40. $\frac{RR}{D} \times \frac{DR}{DD} = \frac{DR}{D} + \frac{RR}{D} + \frac{DR}{DD} + \frac{RR}{DD}$

41. $\frac{RR}{D} \times \frac{DR}{DR} = \frac{DR}{D} + \frac{DR}{R} + \frac{RR}{D} + \frac{RR}{R} + \frac{DR}{DD} + \frac{DR}{DR} + \frac{RR}{DD} + \frac{RR}{DR}$
42. $\frac{RR}{D} \times \frac{DR}{RR} = \frac{DR}{R} + \frac{RR}{R} + \frac{DR}{DR} + \frac{RR}{DR}$
43. $\frac{RR}{D} \times \frac{RR}{DD} = \frac{RR}{D} + \frac{RR}{DD}$
44. $\frac{RR}{D} \times \frac{RR}{DR} = \frac{RR}{D} + \frac{RR}{R} + \frac{RR}{DD} + \frac{RR}{DR}$
45. $\frac{RR}{D} \times \frac{RR}{RR} = \frac{RR}{R} + \frac{RR}{DR}$
46. $\frac{RR}{R} \times \frac{DD}{DD} = \frac{DR}{D} + \frac{DR}{DR}$
47. $\frac{RR}{R} \times \frac{DD}{DR} = \frac{DR}{D} + \frac{DR}{R} + \frac{DR}{DR} + \frac{DR}{RR}$
48. $\frac{RR}{R} \times \frac{DD}{RR} = \frac{DR}{R} + \frac{DR}{RR}$
49. $\frac{RR}{R} \times \frac{DR}{DD} = \frac{DR}{D} + \frac{RR}{D} + \frac{DR}{DR} + \frac{RR}{DR}$
50. $\frac{RR}{R} \times \frac{DR}{DR} = \frac{DR}{D} + \frac{DR}{R} + \frac{RR}{D} + \frac{RR}{R} + \frac{DR}{DR} + \frac{DR}{RR} + \frac{RR}{DR} + \frac{RR}{RR}$
51. $\frac{RR}{R} \times \frac{DR}{RR} = \frac{DR}{R} + \frac{RR}{R} + \frac{DR}{RR} + \frac{RR}{RR}$
52. $\frac{RR}{R} \times \frac{RR}{DD} = \frac{RR}{D} + \frac{RR}{DR}$
53. $\frac{RR}{R} \times \frac{RR}{DR} = \frac{RR}{D} + \frac{RR}{R} + \frac{RR}{DR} + \frac{RR}{RR}$
54. $\frac{RR}{R} \times \frac{RR}{RR} = \frac{RR}{R} + \frac{RR}{RR}$

In the above formulas, the only symbols that represent cases of mental deficiency are, for male subjects, RR, and for female subjects, $\frac{RR}{R}$. The reader will observe, accordingly, that of the 54 theoretically possible types of mating, only 16 can result in mentally deficient offspring. Matings Nos. 32, 33, 35, 36, 50, 51, 53, and 54 may result in mentally deficient offspring equally distributed in the two sexes.

Special attention is called to matings Nos. 23, 24, 26, 27, 41, 42, 44, and 45, which can result in only normal female offspring and in either normal or mentally deficient male offspring. It is these types of mating that would offer at least a partial explanation for the greater incidence of mental deficiency in males.

It will be further observed that in the formulas in which sex linkage as a factor in mental deficiency is represented, either both parents are normal or the father is normal and the mother is mentally deficient. In cases in which the father is mentally deficient and the mother normal or in which both parents are mentally deficient, mental deficiency may be expected to be equally distributed in the two sexes among the offspring, as far as the factor of sex linkage is concerned.

In the light of these considerations, it has seemed desirable to re-investigate family pedigrees in cases of mental deficiency. The object of such re-investigation would be twofold: first, to see if clinical material would bear out the theory of a sex-linked factor in some cases of mental deficiency; and second, to determine its relative importance among other factors, if there be any, in the production of the relative excess of mental deficiency in the male sex.

Not having in our possession an adequate amount of the necessary material, we turned to Goddard's published pedigrees. The possibility of sex linkage had already been pointed out by Goddard on the basis of findings contained in the table to be found on page 553 of his book (12). The 42 matings, FF x NF (father feeble-minded, mother normal but simplex), resulted in 71 feeble-minded offspring, as compared with the theoretical expectation of 72. In contrast with this finding, the 61 matings, NF x FF (father normal but simplex, mother feeble-minded), resulted in 122 feeble-minded offspring, as compared with the theoretical expectation of $96\frac{1}{2}$. The offspring are not classified by sex, and a further investigation of this matter was not attempted in that connection. Goddard states merely, "There may be something approaching a sex limited inheritance."

We went over Goddard's charts from 1 to 198, inclusive, representing his "hereditary" and "probably hereditary" groups. In doing so we separated the matings into two groups. The first of these included F x F (both parents feeble-minded) and F x N (father feeble-minded, mother normal); the second group included N x N (both parents normal) and N x F (father normal, mother feeble-minded).

The first of these groups, according to theory, may result in feeble-minded offspring equally distributed in the two sexes; any excess of cases of mental deficiency found here among the male offspring must be attributed to factors other than sex linkage.

The second group, according to theory, may result in feeble-minded offspring of both sexes; but if there is such a thing as sex linkage as a factor in the inheritance of mental deficiency, the cases in which such a factor operates will be included in this group. Theoretically, there should be a greater excess of cases of mental deficiency in the male over the female offspring resulting from these matings than in the first group; and this excess would be attributable not only to factors which may be assumed to operate equally in the two groups, but also to the additional sex-linked factor.

We found in both groups a total of 206 matings which had resulted in 546 mentally deficient offspring. Of these, 308 were male and 238 female. This represents an excess of 29.41 per cent of mentally deficient males as compared with females.

In the material contained in group 1 (F x F and F x N), there were 149 matings which had resulted in 449 mentally deficient offspring. Of these, 247 were male and 202 female: the excess of mental deficiency in the male sex over the female theoretically attributable to factors other than sex linkage amounts to 22.28 per cent.

In the material contained in the second group (N x N and N x F), there were 57 matings which had resulted in 97 mentally deficient offspring. Of these, 61 were male and 36 female. The relative excess of mental deficiency in the males here amounts to 69.44 per cent. Assuming that an excess of 22.28 per cent is here, as in the first group, attributable to factors other than sex linkage, it would leave a relative excess of 47.16 per cent to be accounted for by the sex-linked factor.

Calculation further shows that, of the total of 308 mentally deficient male offspring, sex linkage was a factor in 17 cases. The total relative excess of mental deficiency in the male sex, as already stated, was 29.41 per cent; the excess attributable to

factors other than sex linkage was 22.28 per cent; and the excess attributable to the factor of sex linkage alone amounted to 7.13 per cent.

These percentages pertain, of course, only to Goddard's material, which is institutional material and probably otherwise selected as well. It is a question whether they would hold for mental deficiency in unselected material and for the distribution of intellectual endowment within normal limits in the two sexes. The reader will note that Goddard's material is apparently overloaded with matings in which both parents are mentally deficient. Of the total of 206 matings included in the material borrowed by us, no fewer than 112 matings were of this one type. Only 57 matings were of the two types from which occasionally only male mentally deficient offspring can result.

Following the publication of our hypothesis of sex-linked factors in the inheritance of mental deficiency (13), it has been checked against some material in Germany by Luxenburger (14), who found our hypothesis fitting the observed data with the least forcing, as compared with several other hypotheses that had been suggested.

These findings have raised the question whether the contrast between the sexes pertains only to pathologic degrees of low intelligence or whether a similar contrast is to be found among subjects of normal or superior intelligence as well.

In the hope of finding some light on this question we have sought out in the public schools of Los Angeles and neighboring cities 233 pairs of opposite-sex twins of normal or superior intelligence.* All the subjects had been given in the schools either group or individual intelligence tests—for the most part the former. Almost invariably the same test was administered and scored by the same examiner at the same time in both twins of each pair. The material is presented in Tables XVIII and XIX.

* This was done in 1932 and 1933, before we had been led, for the purpose of this monograph, to draw the arbitrary line between normal and subnormal intelligence at the level of I.Q. 85. In this connection, accordingly, "normal" intelligence is represented by I.Q. 76 or over.

TABLE XVIII

I.Q.'s OF OPPOSITE-SEX TWINS OF NORMAL INTELLIGENCE. (I.Q. 76-119.)

Case No.	Boy	Girl	Case No.	Boy	Girl	Case No.	Boy	Girl	Case No.	Boy	Girl
1.	97	93	41.	89	91	81.	83	87	121.	105	107
2.	115	101	42.	88	118	82.	106	109	122.	118	111
3.	95	112	43.	96	92	83.	85	88	123.	99	97
4.	110	116	44.	112	105	84.	110	112	124.	113	111
5.	94	100	45.	89	83	85.	96	84	125.	81	83
6.	113	93	46.	101	94	86.	77	106	126.	96	84
7.	77	79	47.	109	98	87.	92	81	127.	97	107
8.	110	112	48.	90	101	88.	94	115	128.	87	99
9.	80	88	49.	119	110	89.	112	112	129.	85	99
10.	106	111	50.	78	78	90.	98	112	130.	101	102
11.	113	109	51.	113	89	91.	79	92	131.	88	98
12.	103	100	52.	84	105	92.	119	86	132.	82	80
13.	91	111	53.	89	101	93.	100	99	133.	107	112
14.	82	100	54.	99	98	94.	98	100	134.	82	88
15.	96	104	55.	110	103	95.	108	119	135.	101	94
16.	101	90	56.	103	88	96.	98	90	136.	90	84
17.	105	102	57.	118	110	97.	91	95	137.	99	110
18.	82	89	58.	93	85	98.	117	113	138.	115	108
19.	94	95	59.	85	100	99.	89	99	139.	84	97
20.	114	91	60.	83	97	100.	100	112	140.	112	116
21.	82	88	61.	102	98	101.	104	110	141.	87	86
22.	85	105	62.	101	103	102.	118	116	142.	104	115
23.	89	91	63.	95	88	103.	88	88	143.	106	108
24.	102	93	64.	88	101	104.	111	112	144.	81	105
25.	100	101	65.	107	117	105.	110	117	145.	88	93
26.	114	115	66.	111	110	106.	115	112	146.	92	101
27.	96	107	67.	106	97	107.	80	94	147.	102	109
28.	109	107	68.	89	91	108.	92	108	148.	110	106
29.	90	87	69.	108	102	109.	107	103	149.	87	89
30.	94	82	70.	110	102	110.	116	104	150.	108	100
31.	97	95	71.	79	117	111.	110	111	151.	97	99
32.	96	95	72.	91	104	112.	106	115	152.	97	94
33.	97	116	73.	108	117	113.	101	100	153.	89	98
34.	107	118	74.	109	110	114.	110	107	154.	105	114
35.	102	95	75.	87	95	115.	88	84	155.	99	98
36.	101	101	76.	95	95	116.	100	107	156.	95	113
37.	88	99	77.	101	97	117.	91	110	157.	102	106
38.	119	112	78.	103	97	118.	88	106	158.	105	114
39.	98	110	79.	90	110	119.	117	108	159.	107	98
40.	104	83	80.	100	96	120.	117	99	160.	102	87

The sex distribution of intelligence in these cases may be summarized as follows:

Boy's I.Q. higher than girl's.....	102 cases
Boy's I.Q. equal to girl's.....	6 cases
Boy's I.Q. lower than girl's.....	125 cases

It seems, then, that among opposite-sex twins of normal or superior intelligence there is, as in the mental deficiency group,

a relative excess of cases of the higher intelligence in the girl, such excess amounting to 22.5 per cent.

According to the theory of a sex-linked factor of intelligence, some idea may be gained of the extent to which the unequal sex distribution of intelligence in opposite-sex twins or in opposite-sex siblings may be attributed to a sex-linked genetic factor, by dividing the cases according to the relative intelligence of the two parents.

TABLE XIX

I.Q.'s OF OPPOSITE-SEX TWINS OF SUPERIOR INTELLIGENCE
(I.Q. 120 OR HIGHER IN ONE OR BOTH OF EACH PAIR.)

Case No.	Boy	Girl	Case No.	Boy	Girl	Case No.	Boy	Girl	Case No.	Boy	Girl
1.	123	122	21.	120	104	41.	107	140	61.	106	120
2.	106	140	22.	132	127	42.	127	98	62.	128	127
3.	101	126	23.	107	121	43.	153	125	63.	122	102
4.	153	161	24.	107	121	44.	134	100	64.	108	123
5.	107	122	25.	118	120	45.	120	118	65.	122	118
6.	101	125	26.	121	121	46.	136	129	66.	101	143
7.	106	124	27.	93	122	47.	122	118	67.	135	115
8.	117	126	28.	125	123	48.	125	140	68.	148	111
9.	125	131	29.	103	124	49.	120	94	69.	129	114
10.	118	128	30.	114	135	50.	105	133	70.	123	118
11.	108	124	31.	122	112	51.	134	95	71.	135	95
12.	117	125	32.	133	114	52.	103	146	72.	131	121
13.	134	114	33.	120	84	53.	108	120	73.	138	115
14.	132	108	34.	110	120	54.	140	126			
15.	116	125	35.	115	122	55.	110	121			
16.	110	126	36.	136	117	56.	105	120			
17.	119	121	37.	110	135	57.	102	132			
18.	123	111	38.	120	86	58.	138	119			
19.	94	120	39.	122	117	59.	128	137			
20.	108	120	40.	129	108	60.	109	123			

With that point in mind, we administered the Army Alpha test to the parents of 100 pairs of opposite-sex twins of normal or superior intelligence. The resulting material is presented in Table XX.

It will be noted that in 57 instances the father's is the higher score; and in the remaining 43 instances either the mother's score is the higher or the two parents' scores are equal.

Theoretically, the first group—and not the second—may contain the cases in which the higher I.Q. of the girl may be attributed to a sex-linked genetic factor. Any excess of cases of the

TABLE XX

I.Q.'s OF OPPOSITE-SEX TWINS OF NORMAL OR SUPERIOR INTELLIGENCE AND ARMY ALPHA SCORES OF THEIR PARENTS.
 CASES BRACKETED REPRESENT TWO PAIRS OF TWINS OF THE SAME PARENTS.

Case No.	Army Alpha Raw Scores		I.Q.'s		Case No.	Army Alpha Raw Scores		I.Q.'s		Case No.	Army Alpha Raw Scores		I.Q.'s		Case No.	Army Alpha Raw Scores		I.Q.'s	
	Father	Mother	Boy	Girl		Father	Mother	Boy	Girl		Father	Mother	Boy	Girl		Father	Mother	Boy	Girl
1.	87	116	106	108	26.	143	117	83	87	51.	117	130	134	114	76.	151	77	101	126
2.	112	50	99	98	27.	142	117	108	92	52.	111	117	108	124	77.	107	27	88	98
3.	67	99	90	84	28.	90	94	98	90	53.	31	104	107	98	78.	116	65	104	115
4.	129	91	115	112	29.	7	60	108	100	54.	154	159	110	112	79.	95	79	94	115
5.	120	103	115	108	30.	125	183	105	107	55.	90	107	88	93	80.	148	158	104	110
6.	113	121	100	112	31.	114	160	98	112	56.	129	105	117	125	81.	80	41	91	95
{ 7.	75	71	92	81	32.	147	100	97	99	57.	143	174	118	128	82.	94	148	110	117
	75	71	77	106	33.	20	40	82	66	58.	150	155	125	131	83.	35	85	92	101
8.	95	44	96	84	34.	112	53	97	94	59.	124	118	117	126	84.	54	76	82	88
9.	95	92	84	97	35.	89	75	102	87	60.	165	103	98	100	85.	57	88	119	86
10.	168	169	113	111	36.	119	122	110	111	61.	155	152	95	99	86.	88	96	89	98
11.	134	148	118	111	37.	70	76	85	99	62.	110	88	106	124	87.	162	115	101	106
12.	155	142	119	121	38.	110	42	81	105	63.	109	145	101	125	88.	61	111	110	107
13.	137	120	85	75	39.	89	72	88	106	64.	141	92	111	112	89.	150	108	117	108
14.	89	116	101	102	40.	93	73	112	116	65.	162	162	82	80	90.	89	133	100	112
15.	53	44	66	74	41.	114	103	97	107	66.	94	77	103	97	91.	128	68	95	113
16.	70	68	71	84	42.	99	85	106	109	67.	117	73	117	113	92.	184	131	112	112
17.	99	104	110	126	43.	149	112	116	104	68.	83	75	88	84	93.	85	58	87	99
18.	102	125	116	125	44.	70	93	118	116	69.	59	120	87	86	94.	116	79	100	96
19.	142	159	136	108	45.	112	87	91	110	70.	57	55	88	88	95.	61	136	106	140
20.	163	125	108	119	46.	104	72	102	109	71.	84	115	105	114	96.	168	156	123	122
21.	110	77	117	99	47.	39	67	96	84	72.	145	151	107	122	97.	81	81	105	114
22.	107	70	81	83	{ 48.	178	94	106	115	73.	135	161	100	99	98.	77	67	90	110
23.	136	106	79	92		178	94	101	100	74.	73	105	101	94	99.	133	74	100	107
24.	95	43	102	106	49.	175	76	107	103	75.	179	89	153	161	100.	84	103	99	110

higher I.Q. in the girl found in the second group must be attributed to a factor or factors other than a sex-linked genetic factor.

The findings are as follows:

Group I: Father's Army Alpha Score Higher than Mother's.

Boy's I.Q. higher than girl's.....	19 cases
Boy's I.Q. equal to girl's.....	2 cases
Boy's I.Q. lower than girl's.....	36 cases

Group II: Father's Army Alpha Score Equal to or Lower than Mother's.

Boy's I.Q. higher than girl's.....	17 cases
Boy's I.Q. lower than girl's.....	26 cases

If, in the first group, we may attribute the 19 cases of the higher I.Q. in the boy, together with an equal number of cases of the higher I.Q. in the girl, to accident of distribution, we have left 17 cases (89.5 per cent) representing a relative excess of cases of the higher I.Q. in girls, which must be attributed mainly not to accident of distribution but to sex-linked genetic factors plus whatever other factors there may be.

In the second group, the excess of cases of the higher I.Q. in the girl, amounting to 9 cases (52.9 per cent), has to be attributed, according to theory, to factors other than sex linkage.

Assuming that these factors other than sex linkage are operative to the same extent in the first as in the second group, it would appear that an excess of cases of the higher I.Q. in the girl, amounting to 36.6 per cent in the first group, or 19.4 per cent in the entire material, is theoretically attributable to sex-linked genetic factors; while an excess of cases of the higher I.Q. in the girl amounting to 52.9 per cent in both groups is theoretically to be attributed to some other factor or factors.*

We are now confronted with the question, What are the factors, other than sex-linked genetic factors, which may cause the

* It goes without saying that these percentages, as well as others derived by similar computations throughout this communication, are offered merely as condensed showings of our material for the convenience of the reader. The material itself is presented fully in the various tables. It is, however, scarcely sufficient in amount to serve as a basis for exact calculations. Further accumulations of similar material in other localities would be required for a verification of our findings.

contrasts in the scores obtained on intelligence tests as between the two sexes?

There is evidence in our material indicating that the development of intelligence can be interfered with by unfavorable conditions existing in the fetal life period or occurring during the process of birth.

Fetal metabolism and growth are, of course, dependent on nutrition, respiration, and elimination accomplished vicariously by the mother for the fetus through the medium of the placental circulation. Unless the mother possesses corresponding functional capacities in a measure not only adequate for her own needs, but also with an ample margin for the fetal needs as they increase with the progress of pregnancy, a state of ill-health will result for the mother, or the fetus, or both.

As far as the fetus is concerned, under such conditions, the common results are premature expulsion, still-birth, a below-normal weight at birth, and abnormally high rate of mortality in early infancy.

For obvious reasons, this condition of inadequacy of marginal function in the mother occurs more often in multiple than in single pregnancies. Not infrequently both of a pair of twins—whether monozygotic or dizygotic—show the effects of their handicap of prenatal life. More often it happens that, through some advantage of position or circulation, one of the twins attains a superior development more or less at the expense of the other. This can go so far as to enable only one of the twins to survive.

It goes without saying that in cases in which maternal function is adequate and handicaps of position or circulation do not exist in prenatal life, perfect development of both twins is quite possible. This is, indeed, the fact in the majority of cases of twin pregnancy.

That unfavorable prenatal or intranatal conditions produce mental, as well as physical, effects, is demonstrated by the following findings in some further material gathered by us.

This material consists of the results of intelligence tests in 34 pairs of monozygotic twins selected on the basis of superior

intelligence: the I.Q. of one or both of each pair is 120 or over. The material is presented in Table XXI.

TABLE XXI

I.Q.'s OF MONOZYGOTIC TWINS OF SUPERIOR INTELLIGENCE.
(I.Q. 120 or higher in one or both of each pair.)

Case No.	Males		Case No.	Males		Case No.	Females		Case No.	Females	
1.	140	140	11.	120	119	16.	135	133	26.	122	121
2.	132	134	12.	124	126	17.	129	129	27.	122	108
3.	120	107	13.	120	119	18.	138	138	28.	118	150
4.	152	148	14.	120	114	19.	125	123	29.	134	128
5.	156	149	15.	120	118	20.	122	117	30.	128	126
6.	126	122				21.	122	123	31.	118	120
7.	131	135				22.	121	121	32.	130	115
8.	158	150				23.	120	115	33.	147	153
9.	122	118				24.	125	123	34.	132	135
10.	122	125				25.	123	118			

It will be seen that in 25 out of the 34 cases the I.Q.'s of the two twins either are equal or differ by not more than five points. In the remaining 9 cases there are differences in points of I.Q. distributed as follows: 6, 6, 6, 7, 8, 13, 14, 15, 32.

Inasmuch as we are dealing here with monozygotic twins, the presumption is that the hereditary endowment of the two twins of each pair is identical. Therefore, in so far as these differences are in excess of ordinary range of error inherent in the testing technique—surely in the last four cases—they must be attributed to prenatal or intranatal factors, and not to hereditary or germinal factors.

Assuming that in these cases the hereditary intellectual endowment is represented by an I.Q. at least equal to that of the more intelligent twin of each pair, it is clear that in no less than 12 per cent of the cases some prenatal or intranatal factor or factors have produced a relative mental deficiency in one of the twins.

As control material, for comparison with the series of cases listed in Table XXI, we submit, in Table XXII, the results of intelligence tests in 41 pairs of same-sex dizygotic twins similarly selected on the basis of superior intelligence. Here we find in only 7 cases the I.Q.'s of the two twins to be equal or to differ by not more than five points. In the remaining 34 cases we find differences in points of I.Q. ranging from 6 to 53 points.

Assuming that here, too, in something like 12 per cent of the cases differences in the I.Q.'s have been produced by some pre-natal or intranatal factors and making similar allowance for differences possibly attributable to error of technique, we find that in about 58 per cent of the cases listed in Table XXII there are differences in intelligence between the twins of each pair attributable to differences in hereditary intellectual endowment.

TABLE XXII

I.Q.'s OF SAME-SEX DIZYGOTIC TWINS OF SUPERIOR INTELLIGENCE.
(I.Q. 120 or higher in one or both of each pair.)

Case No.	Males		Case No.	Males		Case No.	Females		Case No.	Females	
1.	121	96	11.	125	108	20.	138	112	30.	127	106
2.	130	120	12.	137	116	21.	126	109	31.	127	130
3.	134	110	13.	126	100	22.	136	120	32.	124	91
4.	136	128	14.	127	122	23.	123	120	33.	120	112
5.	129	103	15.	125	123	24.	133	119	34.	121	98
6.	143	90	16.	168	140	25.	156	114	35.	140	118
7.	124	118	17.	121	97	26.	121	111	36.	147	101
8.	134	90	18.	132	106	27.	124	118	37.	143	113
9.	134	129	19.	120	116	28.	122	122	38.	121	98
10.	154	113				29.	124	116	39.	120	98
									40.	134	120
									41.	121	110

It is a well known fact that, in connection with both single and multiple births, fetal and early infant mortality is consistently higher in the male than the female sex. This is counterbalanced by the primary male/female sex-ratio, which is very high. According to Auerbach (15), the sex-ratio of fetal mortality varies with the month of gestation, as follows:

Second month	4.52
Third month	3.22
Fourth month	2.29
Fifth month	1.63
Sixth month	1.16
Seventh month	1.16

It has been estimated that at least 20 per cent of all pregnancies terminate in abortion, miscarriage, or still-birth. The sex-ratio of still-births, without reference to the length of gestation, as given by various authors for various countries (Bodio, Davis, Heape, Quetelet, Rauber, and others, for countries of

northwestern and central Europe and for the United States) varies between 1.246 and 1.445 or even higher (Crew) (16).

The so-called secondary sex-ratio—the ratio among newly born infants—seems to fluctuate between 1.04 and 1.06. A further equalization of the sexes in the population is accomplished by the relatively higher male infant mortality which is observed in all countries and under the most diverse conditions of infant welfare. This is shown in the following statistics of child death rates per 1,000, for the years 1901–1910, in countries selected as representing good, bad, and indifferent conditions of child hygiene (Woodbury) (17).

Country	Males					Females				
	0-1 yr.	1-2 yrs.	2-3 yrs.	3-4 yrs.	4-5 yrs.	0-1 yr.	1-2 yrs.	2-3 yrs.	3-4 yrs.	4-5 yrs.
Norway.....	81.4	18.4	8.6	6.3	5.2	66.8	16.8	9.0	6.2	4.9
United States..	127.4	30.2	13.7	8.8	6.5	105.5	27.4	12.6	8.3	6.1
England.....	144.3	40.4	15.9	10.0	7.4	117.4	37.6	15.2	10.0	7.5
India.....	290.0	91.2	65.7	48.3	36.0	284.6	86.2	61.6	45.1	33.7

The evidence seems conclusive to the effect that, in general, male fetuses and infants are for some unknown reason more vulnerable than female.

Our theory is that the cerebrum shares in this relatively higher vulnerability of the male; and so prenatal and intranatal pathogenic factors which fall short of a lethal effect give rise, among surviving children, to a higher incidence of both relative and absolute mental deficiency in the male than in the female sex.

That pathogenic factors acting in the fetal period of life and during the process of birth are capable of producing mental deficiency has been amply shown (7, 9, 18, 19, 20, 21, 22). As already stated, such factors are more often at work in multiple than in single births. Accordingly, the theoretical expectation would be that the contrast in intelligence would be found greater between opposite-sex twins than between opposite-sex siblings.

This introduces an opportunity of verifying the theory of the greater vulnerability of the male fetus as a factor in the unequal distribution of intelligence in the sexes. A comparison of opposite-sex twins with opposite-sex siblings should throw some light on the matter.

The material which we are able to present for the purpose of such a comparison consists, on the one hand, of the I.Q.'s of opposite-sex twins of normal or superior intelligence already listed in Tables XVIII and XIX, and, on the other hand, of the results of intelligence tests in groups of siblings in the city schools of Long Beach, California.

The test records of 880 groups of siblings were gathered—a total of 2,017 individuals, 1,010 boys and 1,007 girls.* The tests had been given by the counselors in the various schools of the system and were mainly the Stanford-Binet, National, Terman Group, Pintner-Cunningham, and the Detroit series.

The average I.Q. of the boys in this collection is 105.6 (S.D. 14.4; P.E. 9.7). The average I.Q. of the girls is 107.9 (S.D. 14.0; P.E. 9.5).

The I.Q. of each boy, who has one or more sisters, has been compared with the I.Q. of each of his sisters. In a total of 713 comparisons thus made, the following was found:

Boy's I.Q. higher than girl's.....	315 cases
Boy's I.Q. equal to girl's.....	21 cases
Boy's I.Q. lower than girl's.....	377 cases

Thus, while among the opposite-sex twins the relative excess of cases of the higher I.Q. in the girl amounts to 22.5 per cent, the corresponding figure among opposite-sex siblings is but 19.7 per cent—a finding in harmony with theoretical expectation.

It has been pointed out many times that the incidence of mental disease, crime, and mental deficiency is relatively higher among the first-born than among those subsequently born (Pearson) (23).

It is a matter of common knowledge that a first pregnancy, and more particularly a first childbirth, as a rule presents greater difficulty than subsequent ones from the standpoints of both the mother and the child. There is a higher incidence of premature birth and of fetal and early infant mortality among the first-born; labor is of longer duration and birth traumas are more frequent.

This suggests an opportunity of subjecting our theory to

* These numbers include a few twins which have not been used in some later calculations.

further test. A comparison of the first-born with the later-born in our groups of siblings should throw some light on the question of the effect of primogeniture on intelligence in general and in the sexes separately.

The figures revealed by an analysis of our material are as follows:

The average I.Q. of 424 first-born boys is 103.7 (S.D. 14.9; P.E. 10.0).
 The average I.Q. of 572 later-born boys is 106.3 (S.D. 14.1; P.E. 9.5).
 The average I.Q. of 448 first-born girls is 107.6 (S.D. 14.1; P.E. 9.5).
 The average I.Q. of 553 later-born girls is 107.9 (S.D. 13.7; P.E. 9.2).

In a total of 1,105 comparisons of the I.Q.'s of first-born with later-born children, regardless of sex, the findings were as follows:

I.Q. of the first-born is the higher.....	448 cases
I.Q. of the first-born is the lower.....	627 cases
I.Q.'s are equal.....	30 cases

Assuming chance of distribution to be equal as in favor of or against the first-born, we find an excess of cases of the higher I.Q. in the later-born amounting to 39.9 per cent.

Thus it seems that our material bears out the contention to the effect that the first-born as a group are somewhat handicapped, as compared with the later-born, in the matter of intelligence. (See also Thurstone and Jenkins, 24). Is there also in this material verification of the greater cerebral vulnerability of the male?

Following are the results of comparisons made separately for the two sexes:

	No. of Cases	
	Boys	Girls
I.Q. of the first-born is the higher.....	118	115
I.Q. of the first-born is the lower.....	171	150
I.Q.'s are equal.....	8	9

The excess of cases of the higher I.Q. in the later-born, as compared with the first-born, amounts to 44.9 per cent among the boys, and to 30.4 per cent among the girls—again a finding in harmony with theoretical expectation.

In discussing this study on various occasions with interested colleagues and friends, some questions have been raised to which our material affords no answer and concerning which we can offer only conjecture.

It was pointed out to us, of course, that in a study of intelligence, a definition of intelligence should be offered. Unfortunately, the material on which our study is based yields little or nothing toward such a definition.

Our interest at first was centered on institutional cases of mental deficiency, also similar cases found in special classes in the public schools. In comparing these patients with one another and with normal subjects, it was inevitable that we should make use of the results of so-called intelligence tests.

In reporting this study, therefore, we can suggest only an understanding with the reader that by "intelligence" we mean throughout those capacities or abilities which are measured by the so-called tests of general intelligence.

Perhaps the most significant correlations of the scores in such tests are with learning ability as revealed by educational achievement. Educational statistics quite generally reveal a slight but statistically constant sex difference corresponding to the sex distribution of intelligence. For example, in a recent report of the California State Department of Education, the following figures are given: "In the first grade, 20.2 per cent of the boys and 16.2 per cent of the girls repeat school work. Only 4.2 per cent of the boys and 2.2 per cent of the girls in the eighth grade are required to repeat school work" (25).

We have been asked to explain the apparent discrepancy between our findings as to sex distribution of intelligence and the well known fact of the much greater achievement in intellectual fields of activity attained by men as compared with women.

As to this, we would point out that the differences between the sexes in intelligence are so slight, the range of distribution in both sexes so wide, and the overlapping of the two curves of distribution so great, that the possible effect of the sex distribution of intelligence on achievement in intellectual fields of activity could only be a very slight one. Were the advantage in this distribution found to be in favor of the male rather than the female sex, it could not possibly account for the immeasurably greater intellectual achievement of men.

The obvious answer is that intelligence alone does not determine intellectual achievement. Relative lack of opportunity, due to the subjection of women in our man-controlled society, is often mentioned in explanation of the lesser achievement of women. There is undoubtedly a great deal of truth in this; but it is a question whether a new social order providing full equality of opportunity would also equalize intellectual achievement.

Our conjecture is that the differences between the sexes as to initiative, aggressiveness, venturesomeness, and, above all, *special interests* will under all conditions result in a difference in achievement.

The result of our investigation of sex factors in intelligence may be summarized as follows:

The sex distribution of intelligence is unequal, the female sex being slightly favored.

Roughly about one-fifth or one-fourth of the difference seems to be due to a sex-linked genetic factor or factors.

Many cases of both relative and absolute mental deficiency are produced by factors at work in the fetal period of life or during the process of birth. There is a great deal of evidence indicating

that the male fetuses are more vulnerbale than female ones, both in a general way and with respect to the organ of intellectual function—the cerebrum. Therefore, there is a higher incidence of both relative and absolute mental deficiency in the male than in the female sex.

The relatively greater cerebral vulnerability of male fetuses seems to account, roughly, for about three-fourths of the difference in the sex distribution of intelligence.

§ 7. *Theory of Mental Deficiency*

Pre-germinal (hereditary) factors.—Our material, as well as abundant other evidence, reveals almost at a glance that the hereditary determination of intelligence is one thing and hereditary factors in the etiology of mental deficiency are another thing. They require separate discussion.

The available data seem to indicate that hereditary factors determine merely the potentially maximal intellectual development that may be attained by a given individual (26, 27).

In order that this potentiality may be fully realized certain conditions are requisite, the most important of which are the following: (a) There must not be a germinal damage, particularly to the ovum, such as may produce mongolism or possibly some other form of relative or absolute (*i.e.*, pathologic) mental deficiency. (b) In the embryonic period there must not be any condition interfering with normal development and producing meningocele, encephalocele, or other cranio-cerebral pathology. (c) In the fetal period there must not be any condition interfering with normal growth and resulting in premature expulsion of the fetus, or giving rise to the necessity of a forced delivery, or causing, at full term, an immature and markedly underweight condition of the fetus. (d) In the intranatal period there must not be, by reason of dystocia from any cause, or of prematurity or immaturity, or of poor obstetric technique, a cerebral birth trauma. (e) In postnatal life, especially in infancy and childhood, there must not be a head injury, or meningitis, encephalitis, or other infection with cerebral involvement. (f) In postnatal life, too,

there must be such home, school, and general life environment as would foster, stimulate, and provide full opportunity for intellectual development (28, 29).

It is a question whether all these conditions are fulfilled for more than a limited minority of individuals in contemporary society. It is, therefore, also a question whether, in the average case, the results of our intelligence tests represent the full measure of hereditary intellectual endowment, or merely an expression of relative—if not absolute—mental deficiency attributable to one or more non-hereditary factors. In a given case there is hardly a possibility of being quite assured on this point, even though the case be one of superior intelligence.

In a given case the assurance is merely to the effect that the inherited intellectual endowment is at least as high as is indicated by the results of an intelligence test, but may be higher.

The existence of relative mental deficiency in persons of normal or even superior intelligence is demonstrated not infrequently in monozygotic twins. In our own material, Cases Nos. 3, 27, 38, and 32, in Table XXI in the preceding section, are cases in point. It must be assumed that the hereditary intellectual endowment in each case is represented at the least by the I.Q. of the more intelligent twin of the pair: 120, 122, 150, and 130, respectively. Yet the I.Q.'s of the other twins are, respectively, 107, 108, 118, and 115.

Among the hereditary factors of intelligence apparently must be counted a sex-linked factor, as shown in the preceding section. Intelligence, as measured by tests, is not equally distributed in the two sexes, the results being somewhat higher in females (30). Pathologic degrees of mental deficiency are definitely more common in males. These facts are most clearly shown by opposite-sex twins (Tables XII, XVIII, and XIX, in the two preceding sections). However, as already shown, only perhaps one-fifth of this contrast between the sexes is possibly to be accounted for by a sex-linked factor of intelligence; the rest being due apparently to a higher degree of cerebral vulnerability in the male sex.

How much of the mental deficiency represented in our material is attributable solely to hereditary factors?—Only the monozy-

gotic groups affords at least a partial answer to this question. As shown in Table III, § 3, in 64.9% of the cases in that group the twins were similarly affected. The remaining 35.1% of the cases were either dissimilarly affected or presented discordance of findings.

It could not be assumed that all the cases of twins similarly affected were of solely hereditary origin; for there were no fewer than 17.2% of similarly affected cases among the dizygotic twins as well (including both same-sex and opposite-sex twins). It would appear, then, that scarcely more than one-half of the cases are of hereditary origin. The proportion is probably somewhat higher among singly-born subjects with mental deficiency.

It appears from our material that the hereditary factors of mental deficiency hold a more prominent position in the etiology of uncomplicated cases than of the cases in which complications exist in one or both of the twins of the pair, such as infantile palsy, epilepsy, psychotic manifestations, child behavior difficulties, juvenile delinquency, and adult criminality. As is shown in Table V, § 3, the monozygotic twins have the same or nearly the same I.Q. in 72.6% of uncomplicated cases and in only 47.6% of cases with the above listed complications.

It appears further from our material that the hereditary factors hold a more prominent position among the higher, as compared with the lower, grades of mental deficiency. Thus among our monozygotic twins in which both twins had an I.Q. of over 50, the I.Q.'s of the two twins of each pair were the same or nearly the same in 68.8% of the cases. Among those in which at least one of the twins had an I.Q. of 50 or under, the I.Q.'s of the two twins of each pair were the same or nearly the same in but 54.5% of the cases.

Germinal factors.—We have shown elsewhere that germinal factors were the sole cause of mongolism (6). Cases of mongolism in twins have not been included in the material on which this monograph is based.

Fetal and intranatal factors.—It is difficult to disentangle from each other the fetal and intranatal factors. A characteristic situation is one in which, by a complex etiologic mechanism, both

types of factors are involved: factors which are operative in the fetal period determine premature birth, or an underweight condition of the fetus, or both; premature or underweight fetuses, as all know, are much more vulnerable than fully developed fetuses; under such conditions even a slight difficulty in the course of birth often results in a cerebral birth trauma, and thus mental deficiency, infantile palsy, epilepsy, and allied conditions are produced.

For obvious reasons a situation of this sort arises with relatively greater frequency in multiple than in single births. It goes without saying, however, that it can and does arise in single births as well. Moreover, in cases of narrow pelvis, abnormal presentation, or other conditions of dystocia a cerebral birth trauma often occurs in cases of normally developed fetuses under the influence of intranatal factors alone.

It has long been known, of course, that cerebral birth trauma is a cause of mental deficiency, infantile cerebral palsies, epilepsy, and some allied conditions. This mode of etiology is plainly revealed in some individual case histories. But in our material evidence is brought to light indicating that this mode of etiology is much more common than may be judged on the basis of case histories alone. The situation here seems to be similar to that which prevailed when attempts were made to determine the part played by syphilis in the etiology of general paralysis, before the days of the Wassermann reaction, on the basis of data made available by case histories alone.

It would seem that a cerebral birth trauma, which is, at the time of its occurrence, apparently slight, or unnoticed, or even unnoticeable, is capable of producing the conditions mentioned above. The evidence for this is, necessarily, indirect, and, as far as our material is concerned, consists mainly in the fact that the dizygotic twin-brothers and twin-sisters of subjects with mental deficiency are also affected by mental deficiency—of the same, or higher, or lower grade—much more often than their singly-born brothers and sisters. The same is true of epilepsy.

The contrast, in the case of mental deficiency, is as between 53.3 per cent for dizygotic twins and 16.5 per cent for siblings, as

already stated in § 2. In the case of epilepsy the contrast is as between 10.7 per cent for dizygotic twins and from 1.1 to 4.1 per cent for siblings (31).

We have had much occasion to point out that mental deficiency is relatively more common among twins than among singly-born subjects (9, 32). By reason of the handicapping conditions of multiple pregnancy, premature birth, or underweight condition at birth, or both, occur more often among twins than among singly-born subjects. Hence twins are more subject to cerebral birth trauma. Obviously, therefore, the excess of mental deficiency found among twins is attributable to none other than fetal or intranatal factors, or a combination of both.

It would seem that the handicaps of multiple pregnancy and birth, together with their attending hazards, are greater for the group of monozygotic twins than for the dizygotic twins.

To begin with, the number of stillbirths is relatively higher among monozygotic twins. This may be judged from the U. S. Census statistics pertaining to plural births (33). The Census tables do not distinguish between monozygotic and dizygotic twins, but only between same-sex and opposite-sex twins. The same-sex twins include, of course, all the monozygotic twins. The figures for the year 1930 are as follows:

Total twins (individuals) born in same-sex pairs, 34,760. Of these 3,058, or 8.8 per cent, were stillborn.

Total twins (individuals) born in opposite-sex pairs, 17,496. Of these 1,046, or 6.0 per cent, were stillborn.

Assuming that the number of dizygotic same-sex twins was equal to the number of opposite-sex twins and that the percentage of stillbirths among them was also the same, we have left 17,264 twins (individuals) born in monozygotic pairs; and of these 2,012, or 11.7 per cent, were stillborn.

In other words, the percentage of stillbirths among monozygotic twins is practically double that observed among dizygotic twins.

Although no census figures are available to show it, there can be no doubt of the fact, often mentioned by obstetricians and pediatricists, that neonatal and early infant mortality is also higher among monozygotic, as compared with dizygotic, twins. Also

it is highly probable that among surviving twins the incidence of mental deficiency, infantile palsies, epilepsy, and allied conditions attributable to cerebral birth trauma, is higher in the monozygotic, as compared with the dizygotic, group.

Certainly our material suggests, on the one hand, that non-hereditary mental deficiency comprises the bulk of the cases on the level of idiocy and imbecility, and, on the other hand, that such cases are relatively almost twice as common among our monozygotic, as compared with our dizygotic, twins. For, as shown in Tables II, VII, and XII, in §§ 3, 4, and 5, respectively, among a total of 252 twins (individuals) in the monozygotic group 51, or 20.2 per cent, revealed an I.Q. under 50; whereas among a total of 480 twins (individuals) in the same-sex and opposite-sex dizygotic groups only 50, or 10.4 per cent, revealed an I.Q. under 50.

A further important fact, relevant in this connection, is that of the higher incidence of relative and absolute mental deficiency, epilepsy, and certain psychotic conditions, among first-born as compared with later-born subjects.

Postnatal factors.—In our material there are barely a half-dozen cases in which postnatal factors are mentioned as possible causes. This is in harmony with general experience. Apparently such factors play but a minor rôle numerically. The bulk of mental deficiency exists from birth.

Conditions complicating mental deficiency consist in infantile palsies, epilepsy, psychotic manifestations, child behavior difficulties, juvenile delinquency, and adult criminality. One or more of these complications may exist in a given case.

Such complications are seen so commonly that the inference of a fundamental relationship is hardly to be evaded. Of 732 individuals comprised in our twin material there was uncomplicated mental deficiency (I.Q. under 85) in but 333. In 122 subjects there was normal intelligence (I.Q. 85 or over) without complications. In 18 subjects one or more of these complications were found without mental deficiency. In no less than 259 subjects (43.7 per cent of all subjects with mental deficiency) one or more of these complications were found. There is reason to

believe that this is an understatement of the true state of affairs, for in many cases inconspicuous residuals of birth palsies, transient epileptic manifestations, behavior difficulties of a milder sort, and the like, are overlooked and unrecorded in the clinical histories.

In twin pairs, both monozygotic and dizygotic, these complications are, for the most part, irregularly distributed; any one of them may be present in only one or both of the twins, or the two twins may present dissimilar complications, as, for example, epilepsy in one and psychotic disease in the other.

We have already had occasion to point out that non-hereditary factors play a preponderant part in the etiology of mental deficiency of the lowest grades—idiocy and imbecility. In our material it is noteworthy that infantile palsies, epilepsy, and psychotic disorders are found, as complications, in much higher proportions among the low grade, as compared with the high grade cases.

Thus, among our subjects with an I.Q. under 50, infantile palsies were observed in 17.9 per cent of the cases. Among those with an I.Q. of 50 or over they were observed in but 0.8 per cent of the cases.

The corresponding figures for epilepsy are, respectively, 33.7 per cent and 4.1 per cent; and for psychotic complications they are, respectively, 9.5 per cent and 2.5 per cent.

In view of the rather overwhelming evidence indicating that, save in cases of mongolism, the principal non-hereditary factor in the etiology of mental deficiency is cerebral birth trauma, our data almost force the conclusion that cerebral birth trauma is capable of producing now mental deficiency, now an infantile palsy, now epilepsy, now certain types of psychotic disease, now, with significant frequency, a combination of any two or more of these conditions.

Whether in a given case a cerebral birth trauma shall result in stillbirth, or in death in the neonatal period or in early infancy, as it often does; what degree of mental deficiency it shall produce; whether it shall give rise to one or another of the above-mentioned complicating conditions; whether it shall produce but a

relative mental deficiency, *i.e.*, leaving behind an intellectual capacity which is still within normal limits; or whether it shall leave the subject without damage to his neurologic and intellectual function, are, presumably, matters determined by the nature, extent, and localization of the brain injury and by the course of the subsequent tissue reaction.

The other conditions, which are often seen as complications of mental deficiency and of which we have taken special cognizance in connection with our study, namely, child behavior difficulties, juvenile delinquency, and adult criminality, seem to be relatively more often associated with the higher grades of mental deficiency—moronism, borderline, and dull-normal intelligence.

Thus, among our subjects with an I.Q. under 50, child behavior difficulties were observed in 5.3 per cent of the cases. Among those with an I.Q. of 50 or over, they were observed in 7.4 per cent of the cases.

The corresponding figures for juvenile delinquency are, respectively, 5.3 per cent and 13.3 per cent; and for adult criminality they are, respectively, 1.1 per cent and 4.3 per cent.

The questions which arise in this connection are of the highest complexity and will not be further dealt with here. An analysis of them will be attempted in a later study, which is to be based on twin material which we have gathered for this special purpose and a preliminary presentation of which has already been published (34).

When we undertook the task of collecting materials for our study of mental disorders in twins, we hoped, and almost expected, that the old puzzling and troublesome problem of the polymorphism of neuropsychiatric conditions, which had been so often revealed in familial groups, would be eliminated, especially in the monozygotic group, and with it the problem of "dissimilar heredity."

It will be seen, both from our individual case presentations and from the summarized presentations of the material in the various tables, that this expectation was not realized. Quantitative or qualitative dissimilarities or total discordance of findings are revealed, almost as a rule, not only in our dizygotic, but also in

the monozygotic twin-pairs; and even in the same individual we find, with significant frequency, a coexistence of conditions which, in current psychiatric classifications, are assigned positions as independent clinical entities.

In the light of the fundamental relationships between some of these conditions, as revealed by our material, it would seem that the systematist assumptions, on which current classifications are based, are quite untenable and create a mere illusion of order and clarity.

Reference to Tables VI, XI, and XVI, in §§ 3, 4, and 5, respectively, reveals some significant findings pertaining to degree of concordance in twin-pairs. In monozygotic twins there is higher concordance not only as regards uncomplicated mental deficiency, but also as regards the various complicating conditions of which we have taken special cognizance in this study. This suggests that hereditary factors play a part even in cases such as those of infantile cerebral palsies, in which the essential etiology definitely consists almost exclusively in cerebral birth trauma.

It seems doubtful, however, if we are dealing here with hereditary in the ordinary meaning of the term. Monozygotic twins exhibit a similarity not only in relatively simple hereditary characters, such as color of eyes, hair, and skin, but also in complex characters, such as facial features, voice, mannerisms of posture and gait,—characters which must be assumed to be an expression of a general balancing of very many gene factors.

Thus, some data yielded by our material suggest that an undue vulnerability of the brain tissues, or a tendency toward a special type of tissue change in reaction to mechanical trauma, or even a special vulnerability of particular structures in the brain, are among such complex hereditary characters. However this may be, it is only by resorting to some such conjecture that we are able to account not only for the relatively high degree of general concordance of findings in cases of traumatic etiology among monozygotic twins, but also for the special concordance of findings in regard to such complications as infantile cerebral palsies, epilepsy, certain psychotic manifestations, etc.

In connection with juvenile delinquency as a complication of

mental deficiency, a very high degree of concordance of findings is revealed by same-sex dizygotic twins, as is shown in Table XI. This is probably attributable in large measure to joint exposure to common postnatal environmental factors. A special study of this matter we hope to publish in a later monograph.

That sex is a factor of great importance in the etiology of both mental deficiency and its various complicating conditions is shown by the figures in Table XVI, comprising the findings in opposite-sex twins, as compared with those in Table XI, comprising the findings in same-sex dizygotic twins. The Group of opposite-sex twins reveals the least degrees of concordance in almost every respect.

Perhaps the most outstanding general result of our study consists in the importance of cerebral birth trauma in the etiology of mental deficiency and of certain complicating conditions with which it is often associated,—an importance which has heretofore not been fully appraised. Further evidence in support of this manner of etiology has been yielded by material, other than that of our twin cases, of which we have made special investigation (9).

This special investigation was undertaken for the purpose of determining the relation between premature birth and underweight condition at birth to mental deficiency.

The first question which was raised, in this connection, was, *How does the incidence of premature birth (three or more weeks before term) and of underweight condition at birth (5½ lbs. or under) among the feeble-minded compare with that in the unselected population?*

We obtained, partly from the institutional records and partly from the parents, the data concerning premature or full-term birth and weight at birth for a series of cases among the inmates of Pacific Colony (state institution for the feeble-minded at Spadra, California). The cases were taken in alphabetic order without selection, except that cases of mongolism were not included.

Not counting those cases in which the necessary data could not

be ascertained (67 cases), we found ourselves in possession of data pertaining to 122 institutional cases of mental deficiency, distributed as follows:

Born at full term, weight at birth over 5½ lbs.....	96 cases
Prematurely born, weight at birth not given.....	9 cases
Born at full term, weight at birth not over 5½ lbs.....	9 cases
Prematurely born, weight at birth not over 5½ lbs.....	6 cases
Birth unascertained as to prematurity or full term, weight 5½ lbs., or under.....	2 cases

Our control material was obtained by first going over the clinical records of all births in several hospitals in Los Angeles and in Pasadena, as follows: Pasadena Hospital for the years 1917-1926; Good Samaritan Hospital, 1922-1925; Hollywood Hospital, 1924-1925; White Memorial Hospital, 1924-1925; Los Angeles County General Hospital, 1925.

Altogether, 11,666 records were gone over for data concerning premature or full-term birth and weight at birth. Of this number only 9,782 cases were used in our study, 1,884 cases being eliminated, as follows:

Still-born.....	215 cases
Died before leaving hospital.....	329 cases
Multiple births (persons).....	215 cases
Data unascertained	1,215 cases

Among these 9,782 cases we found 381 of either premature birth, underweight condition at birth, or both, distributed as follows:

	Cases
Born three weeks or more before term, weight over 5½ lbs.....	23
Born three weeks or more before term, weight at birth not ascertained..	11
Born three weeks or more before term, weight 5½ lbs. or under.....	208
Birth unascertained as to prematurity or full term, weight 5½ lbs or under.....	26
Birth at full term, weight 5½ lbs. or under.....	113

It appears, then, that in our group of mentally deficient cases there were premature birth, or underweight condition, or both, in 21.31 per cent; whereas in our control series obtained from maternity services the corresponding percentage was 3.89—somewhat under one-fifth as high.

If children with an I.Q. under 76 be counted as having mental deficiency, we find that in the group of cases under consideration the incidence of mental deficiency amounted to 10.27 per cent.

In Terman's (30) series of 905 unselected children of elementary school ages the percentage of cases with an I.Q. under 76 was but 2.63—about one-fourth of the figure for the premature and underweight children.

Inasmuch as the more severe results of head injury at birth, such as idiocy and the lower grades of imbecility, also those cases of mental deficiency which are complicated with the crippling effects of Little's disease or with epilepsy, are automatically precluded from school attendance, it may be judged that here, too, the contrast between the premature or underweight children and the control group, as revealed by our figures, is an understatement of the case—exactly to what extent, it would be impossible to say.

The evidence seems conclusive to the effect that premature birth, or underweight condition at birth, is an etiologic factor in mental deficiency. For the most part, if not entirely, the damage in such cases is caused by cerebral trauma occurring during birth. Premature and underweight children are much more liable to suffer such damage at birth than are children born at full-term and of normal weight. Prematurity and underweight condition at birth are much more common in multiple than in single births; for that reason, and probably by the same mechanism, mental deficiency is produced more often in twins than in single births. Similar findings had previously been reported by Looft (32, 35).

It should be pointed out that our material demonstrates just as conclusively that premature birth, or underweight condition at birth, or both, *per se*, do not cause mental deficiency. In our group of cases no fewer than 19.29 per cent of those in which the I.Q. had been ascertained showed an I.Q. of over 115. The corresponding figure for Terman's group of 905 unselected children is but 11.55 per cent. On this point our material bears out the contentions of such writers as Comberg (36), Mohr and Bertelme (37), and some few others (38).

§ 8. *Summary.*

The main objects of this communication are to report our observations in 366 pairs of twins with mental deficiency in one or both twins of each pair and to submit the results of a study of the etiology of mental deficiency based largely on this material.

A classification of the etiologic factors of mental deficiency is suggested, based on the developmental periods in which these factors are operative, as follows: pre-germinal (hereditary), germinal, embryonic, fetal, intranatal, and postnatal factors.

The criteria required for attributing the condition in question to one or another of these groups of factors are briefly discussed.

Three types of etiologic mechanisms are distinguished: simple etiology, wherein the disease-producing action is limited to a factor or factors operative in only one of the developmental periods which have been enumerated; multiple or variable etiology, wherein the condition in question may be produced now by a factor operative in one developmental period, now by one operative in another; and complex etiology, wherein two or more factors, operative in different developmental periods, are required to produce the condition in question.

Early in the course of our study we gained the impression that the relative importance of the various factors in the etiology of mental deficiency was not the same for the higher-grade groups—moronism, borderline conditions, and dull-normal intelligence—as for the lower-grade groups—idiocy and imbecility.

The higher-grade groups seemed to present the larger problems both numerically and sociologically. Accordingly, in selecting our material we have counted as mentally deficient all subjects with an I.Q. under 80. If, however, the other twin of a given pair had an I.Q. within five points of the first twin, he or she was also counted as mentally deficient in similar degree. In pursuit of this policy all subjects with I.Q. under 85, included in our material, were counted as mentally deficient.

A general survey of our material is presented in Table I. The data revealed in this table suggest the following general propositions: (a) Pre-germinal (*i.e.*, hereditary) or germinal factors seem to play an important part in the etiology of mental defi-

ciency. (b) In a considerable proportion of cases pre-germinal or germinal factors, if they exist at all, are not in themselves adequate for the production of mental deficiency. (c) Pre-germinal or germinal factors are not always present—therefore not essential—in the etiology of mental deficiency. (d) Sex is a factor in the etiology of mental deficiency. This is shown especially in our group of opposite-sex twins among whom the excess of males affected, as compared with females, amounts to 27.6 per cent.

Section 3 is devoted to a detailed presentation of the case records of 126 pairs of monozygotic twins. These case records are arranged in groups by sexes and according to whether the twins in each pair are affected in similar or dissimilar degree, or show only one to be affected, or whether either twin presents one or more of the following complicating conditions: infantile palsy, epilepsy, psychotic manifestations, child behavior difficulty, juvenile delinquency, and adult criminality.

Toward the end of § 3 a summary of the findings in monozygotic twins is presented in Tables II–VI together with a brief preliminary discussion of them.

Sections 4 and 5 are devoted to a similarly arranged presentation, summary, and discussion of 101 pairs of same-sex dizygotic twins and of 139 pairs of opposite-sex twins.

Section 6 is devoted to a special investigation of sex factors in intelligence and in the etiology of mental deficiency. This investigation is based partly on the material contained in our group of opposite-sex twins with mental deficiency; partly on 308 pairs of twins and 880 groups of siblings of normal or superior intelligence; and partly on Goddard's published pedigrees in cases of mental deficiency.

The data yielded by this material seem to indicate the following: (a) That mental deficiency and some of its complicating conditions are more common in the male than in the female sex. (b) That the sex distribution of intelligence is unequal, the female sex being slightly favored. (c) That roughly about one-fifth or one-fourth of the difference between the sexes is attributable to sex-linked genetic factors of intelligence. (d) That

the remainder of the difference is attributable to the relatively greater cerebral vulnerability of male fetuses which renders males more liable to develop relative or absolute mental deficiency as a result of cerebral birth trauma.

Section 7 is devoted to a discussion of theory of mental deficiency, the principal features of which are as follows:

Hereditary determination of intelligence is one thing, and hereditary factors in the etiology of mental deficiency are another. The available data seem to indicate that hereditary factors determine merely the potentially maximal intellectual development that may be attained by a given individual. In order that this potentiality may be fully realized favorable conditions must prevail through the various developmental periods, from the germinal period through adolescence, until full maturity is attained. It is a question whether all these conditions are fulfilled for more than a limited minority of individuals in contemporary human society.

The existence of relative mental deficiency in persons of normal or even superior intelligence is demonstrated not infrequently in monozygotic twins.

It would seem that scarcely more than one-half of the cases of mental deficiency are of hereditary origin.

Hereditary factors hold a more prominent position in the uncomplicated cases than in those in which such complications exist as infantile palsy, epilepsy, etc.

It appears further that hereditary factors hold a more prominent position among the higher than the lower grades of mental deficiency.

Germinal factors seem to be the sole cause of mongolism.

Mental deficiency, both relative and absolute, other than mongolism, and the complications with which it is frequently associated, are more common in twins than in singly-born subjects; they are more common in monozygotic than in dizygotic twins; in males than in females; in the first-born than in the later-born; and in subjects who are prematurely born or markedly underweight at birth than in those born at full term and of normal weight. All this points directly or indirectly to cerebral birth

trauma as a factor of the highest importance in the etiology of mental deficiency. This is especially true of the lower grades of mental deficiency, but is also true to a large extent of the higher grades and of relative mental deficiency.

Our material seems to have shed considerable light on the puzzling phenomenon of polymorphism of mental disorders in familial groups. "Dissimilar heredity" plays but little, if any, part in it. It is amply shown that a cerebral birth trauma may result now in stillbirth; now in death in the neo-natal period or in early infancy; now in relative or absolute mental deficiency of a higher or lower grade; now in cerebral palsy, epilepsy, or one of the other complications with which mental deficiency is often associated; or it may leave the subject without damage to his neurologic or intellectual function; depending, presumably, on the nature, extent, and localization of the brain injury and on the course of the subsequent tissue reaction.

The point should be emphasized that the conditions discussed here are capable of being caused not only by cerebral birth trauma which may be plainly in evidence at the moment of delivery, but also by intracranial damage which is apparently slight, or unnoticed, or even unnoticeable at that time. The evidence for this, of course, is indirect; but it is, nevertheless, ample and conclusive.

§ 9. *Epicrisis.*

In the course of discussions of this monograph with interested colleagues, in anticipation of its publication, some questions have been raised and criticisms and suggestions offered. The main object of this section is to furnish some supplemental information concerning our material, in order to enable the reader to evaluate it properly.

Our cases of twins with mental deficiency were found in public schools; institutions for the feeble-minded, epileptics, delinquents, and psychotics; clinics; and a few in their own homes, orphanages, through social agencies, and in private medical practice; as shown in Table XXIII.

The control material (normal and superior twins and groups of siblings) was obtained entirely in public schools.

The school and institutional cases were collected in the course of tours which had been undertaken especially for that purpose. A small number of cases were obtained, in the initial stages of our study, by correspondence, but in each case we obtained them from competent observers who had been furnished with our blank forms and mimeographed instructions.

Each school or institution was personally visited and surveyed for twins by

going over the records and questioning officials, professional staff, nurses, attendants, and patients. All twins were included regardless of type and regardless of whether only one or both were in the school or institution, provided the other twin was living and accessible to investigation.

TABLE XXIII
SOURCES OF MATERIAL

	Monozygotic twins		Same-sex dizygotic twins		Opposite-sex twins
	Males	Females	Males	Females	
Schools	19	25	11	18	58
Institutions	39	29	28	32	71
Clinics	2	2	..	4	8
Other sources	5	5	2	6	2
Totals.....	65	61	41	60	139

If the second twin of any pair was not in the school or institution, field investigation was undertaken to secure the data required. Field investigation was also necessary in many cases for the purpose of determining the type of twins. While the diagnosis of the mental disorder and the results of intelligence tests were based on school, clinic, and institutional records in almost all of the cases, the determination of type of twins was undertaken in each case by ourselves as far as possible by personal inspection and, in default of that, from photographs and by detailed questioning of parents or other near relatives. Such determinations were finally arrived at on the basis of the cumulative evidence consisting of criteria already enumerated in § 1. In our opinion the error that may have occurred in this connection could not affect more than 5 per cent of the cases among our same-sex twins.

The investigation of a few cases—not over a dozen in connection with the mental deficiency group—had to be abandoned eventually by reason of the inaccessibility of the second twin or refusal of coöperation.

In the institutional and clinic cases the intelligence scores found in the records were based almost entirely on Stanford-Binet tests. In a large proportion of the school cases standard group intelligence tests had been used—generally the same test given at the same time by the same examiner to both twins of the pair. A few tests were administered by ourselves.

From the beginning of the study we have made special efforts to avoid, in the selection of material, an overloading of it with an undue proportion of monozygotic twins or of twins of any type showing both of the pair affected. The hazard of such a bias in selection exists especially in connection with institutional material, for obvious reasons.

A comparison of the proportions of male, female, and opposite-sex twins in our material with those among twin births (exclusive of stillbirths) furnished by the United States Census would seem to indicate an approximately unbiased selection in that respect:

	Our material	Census figures
Two males	28.96%	33.03%
Two females	33.06%	32.46%
One male, one female.....	37.98%	34.51%

The expected proportion of monozygotic twins among all twins has been estimated, for the United States, to be 32.5 per cent (39). In our material the proportion amounts to 34.4 per cent.

The magnitude of the error that might be incurred through an improper method of selecting materials in psychiatric twin studies has been especially investigated by Luxenburger (40), and is shown in Table XXIV. Mental deficiency, epilepsy, psychotic disease, criminality, and various other neuropsychiatric conditions are represented in this table.

It will be seen that among the cases gathered from the literature and those obtained by the questionnaire method the proportion of monozygotic twins amounted to 48.3 per cent; and the proportion of concordant findings among twins of all types amounted to 60.8 per cent. The corresponding figures for the cases in the uninterrupted series were 28.9 and 23.2 per cent, respectively.

TABLE XXIV

OVERLOADING OF MATERIAL WITH MONOZYGOTIC TWINS AND WITH CONCORDANT FINDINGS IN GROUPS OF CASES GATHERED FROM THE LITERATURE AND OBTAINED BY MAILED QUESTIONNAIRES, AS COMPARED WITH GROUPS OBTAINED IN UNINTERRUPTED SERIES (from Luxenburger).

Method of collecting material	Monozygotic twins			Dizygotic twins			Type of twins unascertained		
	Both affected	One affected	Totals	Both affected	One affected	Totals	Both affected	One affected	Totals
Cases from the literature..	96	19	115	5	36	41	35	30	65
Questionnaire method	12	1	13	..	8	8	13	10	23
Uninterrupted series	28	13	41	2	71	73	3	25	28
Totals.....	136	33	169	7	115	122	51	65	116

For our material the corresponding figures are 34.4 and 64.4 per cent, respectively. However, our material is not strictly comparable with Luxenburger's. As regards type of twins, 29.0 per cent of the cases in Luxenburger's table are reported as unascertained. This we can attribute only to inadequate field investigation, for it means that in nearly one-half of the same-sex twins in the collection the question of type of twins had remained unascertained. The difficulties inherent in the task of determining the type of twins in all but a very small percentage of the cases could not possibly account for such a showing.

As regards the proportion of concordant findings, too, our material is not comparable with Luxenburger's, for it pertains only to mental deficiency and its more common complicating conditions, whereas in Luxenburger's table are represented no fewer than 22 clinical groups including such conditions as cretinism, senile dementia, infectious psychoses, chorea minor, paralysis agitans, syringomyelia, exogenous brain affections, etc.; mental deficiency is represented in but 26 cases.

For obvious reasons, the danger of overloading the material with instances of concordant findings would seem to be greater in connection with institutional cases than with cases found extramurally, especially if the field investigation is inadequate. Accordingly, some idea might be gained of the extent to which such overloading has been avoided in our study from a comparison of our institutional material with that obtained through schools, clinics, social agencies, etc. In Table XXV the material has been segregated for the purpose of facilitating such a comparison.

TABLE XXV
INSTITUTIONAL AND EXTRAMURAL CASES COMPARED

Type of twins	Institutional cases					Extramural cases				
	Both affected		One affected		Totals	Both affected		One affected		Totals
	No.	%	No.	%		No.	%	No.	%	
Monozygotic males	37	94.9	2	5.1	39	22	84.6	4	15.4	26
Monozygotic females	28	96.6	1	3.4	29	28	87.5	4	12.5	32
Same-sex dizygotic males...	19	67.9	9	32.1	28	9	69.2	4	30.8	13
Same-sex dizygotic females	18	56.3	14	43.7	32	16	57.1	12	42.9	28
Opposite-sex	32	45.1	39	54.9	71	34	50.0	34	50.0	68
Totals.....	134	67.3	65	32.7	199	109	65.0	58	35.0	167

Postnatal factors play but a very small part in the etiology of mental deficiency. As already stated, the bulk of mental deficiency exists from birth. Accordingly, there is scarcely anything to be said of age of incidence in this connection, or of age as an etiologic factor. However, the age distribution of our subjects at the times of our observation of them may be of some interest, and it is therefore given, for the reader's convenience, in Table XXVI.

TABLE XXVI
AGE DISTRIBUTION OF SUBJECTS

Type of twins	Under						Over	Totals
	5 yrs.	5-10	10-15	15-20	20-25	25-30	30	
Monozygotic males	2	10	18	18	9	5	3	65
Monozygotic females	3	9	16	18	6	2	7	61
Same-sex dizygotic males...	..	7	17	15	..	1	1	41
Same-sex dizygotic females..	1	5	10	23	10	3	8	60
Opposite-sex	1	21	54	31	10	9	13	139
Totals.....	7	52	115	105	35	20	32	366

It has been suggested to us that, by reason of the known probable errors in Stanford-Binet and other test scores, it might have been better if we had counted as "similarly affected" all those cases of twin-pairs in which the difference in I.Q. was from 0 to 10 points, instead of from 0 to 5 points, as we did. This would have resulted in greater assurance as to the existence of real quantitative dissimilarity or discordance of findings in the remaining cases.

Is it not a question whether, in the pursuit of such a policy for the gaining of greater assurance in judgment concerning individual cases of discordance, a greater and more serious error might not have been incurred, for the entire mass of material, in the direction of overlooking or underestimating slight but possibly important dissimilarities among both monozygotic and dizygotic twins?

However this may be, a further scrutiny of the material will show that such a treatment of it would not materially affect our fundamental findings otherwise than in their numerical relationships, *i.e.*, the facts of quantitative dissimilarities and discordant findings would still be in evidence among monozygotic (as well as dizygotic) twins, while the fact of qualitative dissimilarities would not be affected at all.

A certain amount of arbitrariness, in delimiting the conception of mental deficiency, in classifying and arranging our cases, in tabulating them, and in

the general treatment of our material, characterizes our presentation, as a matter of course. Such arbitrariness has been governed mainly by personal equation based on our special interest in etiology—with an eye to prophylaxis in the field of psychiatry.

We have devoted about two-thirds of the space in this monograph to the presentation of the raw material, as we have it in our files, because we regard it as the most important part of our contribution. It is the largest amount of such material, and, on the whole, richest in data of medical and sociologic import, that has yet been made available, not only in a single collection, but altogether. Our aim has been to open ready access to it for other students who, by a treatment of it from another angle, might possibly extract additional, greater, or better yield out of it. It should certainly make possible a critical evaluation of our treatment and discussion of it.

We venture to express a doubt, however, as to promise of further or more crucial findings that might result from application of more refined statistical techniques. In spite of being, as stated above, the best collection that has yet been gathered, it is defective both in quality and in amount, obviously heterogeneous, and would hardly justify more than a mere counting of noses for the purpose of a preliminary orientation with regard to the bewildering complexity of problems which it presents.

The theory of mental deficiency proposed in this monograph represents merely our evaluation of the data contained in the material and is, of course, tentative. Perhaps in our effort to be both concise and unequivocal we have produced the impression of offering it as a series of dogmatic assertions or final conclusions. If so, then we hasten to add that this is hereby expressly disavowed. This theory, like any other, is but an attempt, on the one hand, to integrate the data contained in our own material and those generally available at present, and, on the other hand, to formulate problems which would indicate definite promising lines of further research.

As regards certain features of our theory, such as those pertaining to sex and order of birth as factors in intelligence, a glance at our figures will show how far they fall short of establishing full support for our postulations. Yet these figures as well as some other data indicated in our references to literature can be regarded as straws showing which way the wind blows and some directions which further research might take.

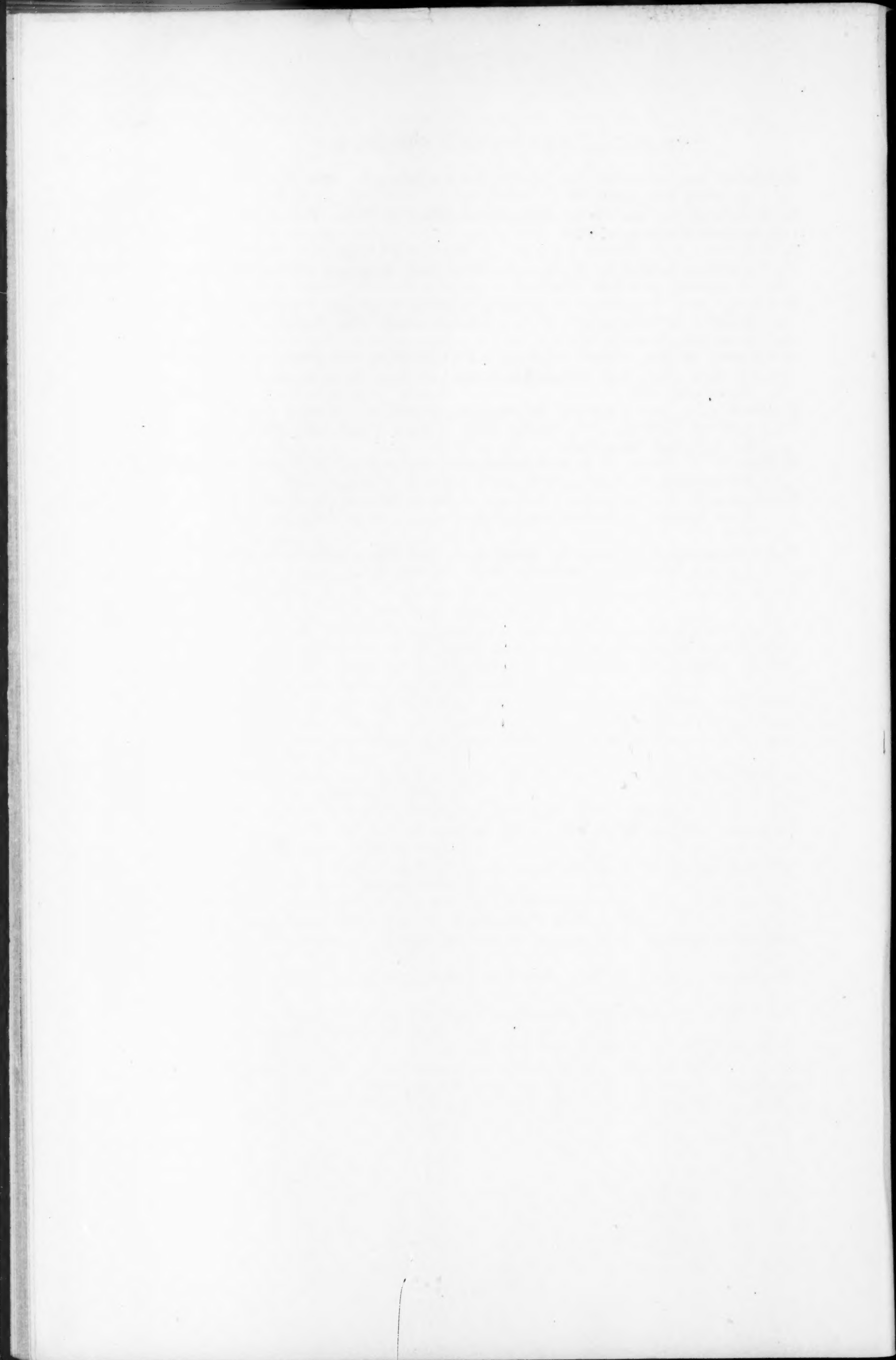
We have been led to feel, by our experience, that a crucial study of mental deficiency with its many ramifications could not be carried out privately. It should be undertaken under federal authority by some such body as the United States Public Health Service, adequately financed and by sanction of special legislative enactment.

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A Chapter in the Genetic History of
Human Intelligence

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